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Management

Entrepreneurial Mindset in a VUCA World

Laura Noel

Abstract

This research explored the relationship between intuitive decision-making and organizational growth during the COVID-19 pandemic while examining the moderating effect of entrepreneurial expertise within a volatile, uncertain, complex, and ambiguous (VUCA) environment. Utilizing a quantitative methods design and the Rational Heuristic Intuition Anticipation (RHIA) scale with 148 entrepreneurs, the study found no significant direct effect of intuitive or analytical decision-making styles on organizational growth nor a moderating effect of experience. However, specific facets of intuition, namely emotional intuition and anticipation, were linked with higher organizational growth levels. The discussion of findings, limitations, and directions for future research were addressed.

Keywords: Intuition, Expertise, Entrepreneurship, VUCA, Decision-Making

Introduction

Entrepreneurial Mindset in a VUCA World

In a world marked by increasing volatility and uncertainty, entrepreneurs face challenges that demand more than just technical expertise; they require adaptive skills, particularly intuition, to navigate effectively (Heifetz, 1994). Unlike technical challenges, which can be solved with existing knowledge, adaptive challenges necessitate new learning and innovation, often requiring a shift in values or perspectives. Leaders with heightened intuition can make informed decisions even with incomplete information by drawing on their subconscious experiences. Johansen (2017) emphasized the importance of developing intuitive competencies in a VUCA (Volatile, Uncertain, Complex, and Ambiguous) world, where intuition enables leaders to anticipate changes and adapt to disruptions. The COVID-19 pandemic further highlighted the value of intuition, as entrepreneurs faced unprecedented challenges that demanded rapid, intuitive decision-making to ensure business continuity and innovation (Sayegh et al., 2004; Abraheem, 2023).

This research aims to explore the nuances of decision-making among entrepreneurs during the pandemic, focusing on the balance between intuitive and analytical processes, and the role of expertise as a moderating factor in decision-making and organizational growth. Although decision-making in crises has been studied, the specific connection between intuitive decision-making and entrepreneurial growth in a VUCA environment remains underexplored.

Dual Process Theory, which distinguishes between fast, intuitive thinking (System 1) and slow, analytical thinking (System 2), provides a framework for understanding this balance (Kahneman, 2014). Previous studies, such as Simmons (2015), have highlighted the biases in management literature that often favor analytical approaches, sidelining intuition. However, Keller and Sadler-Smith (2019) propose that integrating Paradox Theory with Dual Process Theory can help leaders leverage the tension between intuition and analysis, potentially leading to more favorable outcomes.

Intuition plays a crucial role in decision-making, particularly in high-pressure situations where quick judgments are necessary. It allows individuals to make decisions based on feelings, prior experiences, or immediate perceptions without relying on conscious reasoning (Dijksterhuis et al., 2006; Kahneman, 2014). Studies, like those by Pretz et al. (2014) and Polanyi (1958/2012), highlight the diverse forms of intuition holistic, inferential, and affective—and how they integrate various sources of tacit knowledge to guide decision-making. In complex environments, this blend of intuition and analytical reasoning is vital for effective leadership (Keller & Sadler-Smith, 2019).

Expertise significantly influences the effectiveness of intuitive decision-making. Research shows that individuals with domain-specific experience, as outlined by Malewska (2019) and Baldacchino et al. (2022), are more likely to leverage intuition effectively, thanks to their accumulated knowledge and cognitive versatility. The "10-year rule" proposed by Ericsson & Towne (2010) underscores the importance of extensive practice in developing world-class expertise, which in turn enhances intuitive decision-making abilities in complex and uncertain situations.

Organizational Growth within a VUCA environment is closely linked to the decision-making style of entrepreneurs. Intuition, particularly strategic intuition, allows leaders to identify and act on opportunities even amidst uncertainty, as discussed by Abraheem (2023). This research aims to explore how intuitive decision-making, moderated by expertise, impacts organizational growth, measured through financial, operational, and intangible metrics. Understanding this relationship is key to navigating the challenges of a rapidly changing business landscape.

Summary of Hypotheses

For this study, the following hypotheses are proposed:

H1- Intuitive Decision-Making (IDM) will positively predict organizational growth in a VUCA environment.

H2- Expertise will positively predict IDM.

H3- Expertise will moderate the relationship between IDM and growth in a VUCA environment such that the relationship will be enhanced when expertise is high.

Method

Participants

This survey targeted entrepreneurs who have owned a legal business entity recognized by the country or state in which their company operates, operational since before January 2020. Eligible participants were adults (18 years and above) working full-time within their business. The study aimed for a sample size of at least 137 participants to detect a significant moderating effect with an alpha of .05 and a power of .90, as recommended by Shieh (2009).

The present study included 148 respondents who revealed a diverse age range from 23 to 72 years, with a mean age of approximately 37.15 years and a median age of 35 years. The participants also displayed a broad spectrum of professional experience, ranging from 1 to 55 years, with a mean experience of approximately 8.03 years and a median experience of 5 years. The demographic details of the 148 valid respondents (Table 1) showed that 64.9% were male, 34.5% were female, and 0.7% identified as other or non-binary. A significant number of participants held a bachelor's degree at 62.8%, followed by 24.3% with a master's degree, 6.8% with a high school diploma or equivalent, and smaller percentages held other academic or professional qualifications. The ethnic makeup was predominantly White or Caucasian at 70.3%, with Asian or Pacific Islander at 21.6%, Black or African American at 3.4%, and the rest made up of other ethnicities. Industry representation spanned several sectors, with technology leading at 23%, business services at 20.9%, advertising & marketing at 8.8%, manufacturing at 8.1%, finance & financial services at 8.1%, retail at 6.8%, consulting at 4.1%, healthcare at 4.1%, entertainment. & leisure at 3.4%, education at 2.7%, coaching at 2.7%, construction /machinery at 2%, transportation at 2%, network marketing at 1.4%, hospitality at 1.4%, and others at 0.7%.

Procedure and Design

Participants were recruited through the snowball method of sampling through social media and email posts with a direct link (see Appendix A) to the survey in Qualtrics. Participants provided their informed consent (see Appendix B) before participating in the study. Participants were also recruited through Amazon's Mechanical Turk (MTurk) platform and compensated $1.00 per completed survey. MTurk participants provided their informed consent before participating in the study. All participants completed screening questions and, if they were deemed ineligible, were directed to the disqualification message, thanked for their time, and did not complete the survey.

This study used a quantitative survey design and was administered through Qualtrics taking approximately 15 minutes to complete. Participants completed 21 questions measuring decision-making styles: Rational, Intuitive, Emotional, Spontaneous Heuristical, Slow Unconscious, and Anticipation, as well as four demographic questions, one question related to

experience, and six organizational growth questions. Participants received an electronic debriefing and thank you for completing the survey.

Measures

The scale used for this survey was the Rational Heuristic Intuitive Anticipation (RHIA) scale, a 21-question, six-dimension, self-report questionnaire using a 4-point Likert scale ranging from 1 *Strongly Disagree* to 4 *Strongly Agree* (Launer & Svenson, 2020). The RHIA was tested for reliability and was acceptable (α=.87).

Expertise: For this study, expertise was operationalized as the number of years of experience as a business owner or entrepreneur.

Organizational Growth: For this study, organizational growth was operationalized as a percentage of gross profits or losses. Other aspects of growth and losses were also considered, including products or services offered, employees, locations, new clients, and net profits or losses.

Demographics: Demographics were collected through four questions at the end of the. Questions included information regarding age, gender, racial category, the highest level of education, and the industry worked in.

Results

The purpose of this study was to explore the relationship between decision-making style preference, entrepreneurial experience, and organizational growth from the start of the Covid-19 pandemic until the present. The relationships among variables were analyzed using linear regression and moderation analyses. H1 and H2 were tested using linear regression and H3 was tested using moderation. Survey data were downloaded from Qualtrics into IBM SPSS Statistics (Version 29.0.2.0) and cleaned, including checking for missing data, naming variables, and reverse-scoring as needed. Scale reliabilities were calculated using Cronbach's alpha.

IBM SPSS Statistics (Version 29.0.2.0) software was used to analyze the data to conduct linear regressions to test the extent to which Decision-Making Style and Experience predict growth in a perceived VUCA environment. Moderation analysis using PROCESS add-on in SPSS was used to explore the relationship between IDM and growth as moderated by experience. Descriptive analyses (e.g., mean, standard deviation, range) were used to analyze the demographic variables. Finally, post hoc analyses were conducted to gain a deeper understanding of the data.

Hypothesis 1

For hypothesis H1, which posited Intuitive Decision-Making (IDM) would positively predict organizational growth in a VUCA environment. The analysis revealed that IDM did not have a significant predictive effect on organizational growth (β = 13, p = .12). Linear regression results did not support H1 and indicated that IDM did not positively predict organizational growth in a VUCA environment, R^2 =.02, F(1,147) = 2.43, p = .12. Results indicated IDM explained 2% of the variance in growth. In the context of this study, IDM may not directly contribute to organizational growth in VUCA environments. Regression results may be found in Table 2.

Table 2: *Linear Regression for Inductive Decision-Making Predicting Organizational Growth*

Outcome variable	B	$SE\ B$	$β$	R^2
Intuition	19.16	12.28	1.56	.02

Hypothesis 2

Similarly, for hypothesis H2, which suggested Expertise would positively predict IDM, the results indicated a lack of significant relationship between Expertise and IDM (β = -.13, p =.13). These findings imply that in the sample studied, Expertise did not significantly influence the level of Intuitive Decision-Making. Linear regression results did not support H2 and indicated that Experience did not positively predict IDM, R^2 =.02, F(1,146) = 2.30, p = .13. Additionally, results of the linear regression indicated expertise explained 2% of the variance in IDM. This finding suggests that in the context of this study, entrepreneurial expertise may not directly contribute to IDM. Regression results may be found in Table 3.

Table 3: *Linear Regression for Inductive Decision-Making Predicting Organizational Growth*

Outcome variable	B	$SE\ B$	$β$	R^2
Experience	−0.009	0.006	−0.13	.02

Hypothesis 3

Expertise will moderate the relationship between Intuitive Decision-Making (IDM) and organizational growth in a VUCA environment, enhancing the relationship when expertise is high. Hypothesis 3 was not supported and analysis did not reveal a significant moderating effect of expertise on the relationship between IDM and organizational growth (β = -.38, p = .85). This suggests that in the context of this study, expertise did not play a significant role in

strengthening the relationship between IDM and organizational growth within VUCA environments.

Moderated regression results of the interaction effect on organizational growth are show in Table 4.

Table 4

Summary of Moderated Regression Results on Organizational Growth

Interaction effect	*B*	*SE B*	*t*	*p*
Intuition	18.47	12.46	1.48	.14
Experience	−0.37	0.87	−0.42	.67

Post Hoc Tests

Comparison of Means

Additional post hoc analysis was conducted to further explore the relationship between organizational growth and decision-making style by performing a one tailed t-test. An independent samples t-test was conducted to examine the differences in decision-making between entrepreneurs who reported growth above the overall mean of organizational growth and loss and those who scored below the mean (AORBMean). There was no significant difference between the groups in rational or overall intuitive decision-making which included the four intuition subscales, nor were there any significant differences between the groups in the intuitive subscales which include the intuitive, slow unconscious and spontaneous heuristictical subscales. There were significant findings within the intuitive subscales, emotional intuition and anticipation & pre-cognition.

On average, the reported level of growth for entrepreneurs who exhibited more of the emotional intuition (*M* = 3.2, *SD* = .60) was significantly higher than the level of emotional intuition reported by entrepreneurs who experienced growth below the mean (*M* = 3.0, *SD* = .64), *t*(146) = -1.74, *p* < .04, and this effect was medium, *d* = .3. Also, when considering another output from the one tailed t-test and examining anticipation & pre-cognition, significant findings were revealed. Entrepreneurs above the overall growth mean (*M* = 3.31, *SD* = .90) reported higher levels of anticipation & pre-cognition intuition when compared to entrepreneurs who on average earned less than the overall growth mean (*M* = 3.2, *SD* = .58), *t*(146) =1.8, *p* < .03, and this effect was medium, *d* = .3.

Factor Analysis

Exploratory factor analysis was conducted for the RHIA scale to uncover any underlying structures within the data and instrument. IBM SPSS Statistics (Version 29.0.2.0) scale reduction and principal component analysis were used in addition to varimax with Kaiser normalization as the rotation method. Four factors were revealed, and cross-loaded items with similar loadings were removed, leaving 15 of the 21 scale items remaining. The new factors were tested for reliability. Further, the hypotheses were re-tested using regression and moderation analysis using the new four factor structure and the findings were not significant. Factor analysis results are shown in Table 6.

Discussion

The purpose of this study was to gain a deeper understanding of decision-making among entrepreneurs to discern how much they relied on intuitive decision-making versus analytical decision-making during a time when the world was faced with a collective adaptive challenge, the COVID-19 pandemic. This research was conducted using a quantitative survey of entrepreneurs to investigate the connection between decision-making style, organizational growth, and entrepreneurial experience within an environment many believed to be a volatile, uncertain, changing, and ambiguous (VUCA) environment. Overall, statistical analysis of the RHIA scale, organizational growth, and years of entrepreneurial experience revealed findings that support the connection between organizational growth and two types of intuitive decision-making; however, the initial three hypotheses were not supported.

Interpretation of Results

It was hypothesized that overall Intuitive Decision-Making (IDM) would positively predict organization growth in a VUCA environment where entrepreneurs who make decisions more intuitively would experience a higher percentage of organizational gross profits. The results showed no significant difference in predicting organizational growth between entrepreneurs who make intuitive versus analytical decisions. It was also hypothesized that expertise, which was calculated as years of entrepreneurial experience, would positively predict IDM and this was also not supported in the analyses. The final hypothesis, which was that expertise will moderate the relationship between IDM and growth in a VUCA environment such that the relationship will be enhanced when expertise is high, was also not supported in the data. Previous work by Malewska (2019) through interviewing 300 managers, found that one of the determinants of when leaders engage in intuitive decision-making is expertise.

Table 6 *Summary of Exploratory Factor Analysis*

Item (original factor)	Factor			
	1 (α = .86)	2 (α = .79)	3 (α = .60)	4 (α = .65)
Anticipation Precog 2	.74			
Anticipation Precog 4	.73			
Anticipation Precog 1	.72			
Emotional Decisions 2	.71			
Emotional Decisions 3	.69			
Emotional Decisions 1	.66			
Quick Heuristic Dec 3		.81		
Quick Heuristic Dec 1		.79		
Quick Heuristic Dec 2		.65		
Rationality Delib 2			.68	
Rationality Delib 5			.68	
Rationality Delib 4			.66	
Slow Uncon Thinking 1				.79
Slow Uncon Thinking 3				.74
Slow Uncon Thinking 2				.65

Abraheem (2023) investigated organizational performance during environmental uncertainty and the role strategic intuition plays, where leaders leverage accumulated expertise and insights. These previous studies highlighted leaders within organizations rather than entrepreneurs. Additionally, expertise is acquired from specialized and quality practice within a specific domain. Entrepreneurship, in general, may be too broad of a focus, and exploring industry-specific entrepreneurial expertise is worth considering.

Post hoc analyses explored two distinct groups of entrepreneurs: those whose growth surpassed the aggregate mean of organizational growth and those who did not. While there were no significant differences in rational and overall intuitive decision-making styles between the two groups, a notable difference emerged in two of the four intuitive subscales: emotional intuition and anticipation & pre-cognition. Entrepreneurs who reported growth above the mean demonstrated higher emotional and anticipatory intuition levels. Additionally, the average growth rate for the group above the mean was 81%, whereas for those below the mean, it was - 1.75%. These findings suggest different facets of intuition may play an essential role in organizational growth, particularly when dealing with adaptive challenges where creative

thinking and innovation are necessary, as indicated by previous research (Baldacchino et al., 2022). Also interesting to note is that exploratory factor analysis combined the above-mentioned intuition subscales into one factor. The results were similarly significant when t-tests were re-conducted to test between the two growth groups.

Limitations

This study has a few limitations. First, it relied on self-reporting measures to assess gross organizational growth or losses from January 2021 to the present as an approximate percentage, which may have been challenging to recall. Also, some entrepreneurs reported a percentage of growth and loss; a possible limitation could be that they have multiple businesses and accounted for both losses and gains. Second was the combination of convenience snowball sampling and entrepreneurs through MTurk who may have taken the survey without reflecting on the survey questions due to a conflicting motivation of survey completion for payment versus survey accuracy. The RHIA scale has been tested and validated in previous studies in the European Union with employees in different industries. It was surprising to experience a different outcome with the scale when it was deployed with entrepreneurs; this may be a limitation or an opportunity to explore what differentiates entrepreneurs from employees in this context to refine further and adapt the scale for entrepreneurs. Other considerations to keep in mind during this period that may have contributed to growth are the industry in which the businesses operate, whether or not they received government aid, which may have helped keep businesses running, and how entrepreneurs experience their sense of responsibility toward keeping their staff employed.

Future Research

The results of this study offer several possible directions for exploration. First, is further exploration into the specific dimension of intuition and their role on organizational growth could offer insights on the cognitive processes that drive success in entrepreneurship. Longitudinal studies could explore or reveal the growth and evolution of intuitive capacities over time coupled with the impact on business outcomes. Additionally, future studies could benefit from a much more narrow scope by investigating industry-specific entrepreneurial expertise. Furthermore, this research could include entrepreneurs globally, expanding the sample size and potentially having a more global understanding of entrepreneurship in VUCA conditions. Finally, a qualitative approach through case studies and interviews could provide an in-depth understanding of entrepreneurs' lived experience through VUCA conditions, how they made decisions, and the outcomes they generated.

Conclusion

The purpose of this study was to better understand the decision-making style of entrepreneurs and organization growth outcomes in a VUCA environment. Also examined was the moderating effect of expertise on the relationship and dynamic between decision-making style and organizational growth. Further analyses were conducted to understand the data better. As indicated by this study, there is a meaningful relationship between entrepreneurs who reported higher levels of growth and those who exhibited higher levels of emotional and anticipatory intuition. In contrast, those who did not experience growth showed significantly lower emotional and anticipatory intuitive decision-making levels. This study contributes to the literature on decision-making, entrepreneurship, and intuition.

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Peculiarities of the Human Resources Development in State Authorities of Ukraine

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Abstract

Purpose. In the context of the implementation of the administrative reform in Ukraine, issues of modernization of the civil service, a component of which is raising the professional level of civil servants, are gaining priority. Thus, the purpose of the study is to carry out a comprehensive analysis of the process of human resources professional development in state authorities of Ukraine, as well as to determine possible directions for improving the qualifications of civil servants to acquire the necessary competencies.

Design/methodology/approach. When processing of individual underlying data and formulating conclusions of the paper were used methods of analysis, synthesis, induction, deduction comparative and the graphic method.

Findings. The analysis of the indicators of the modern civil service shows that in Ukraine there is a trend towards the development of professionalism and professional competence of the civil servants, their work is used rationally, and motivation to study increases.

Practical implications. The research carried out by the authors makes it possible to determine the peculiarities of the human resources development in state authorities of Ukraine, which will contribute to the timely systematization of data on the need to improve the qualifications and professional competencies of civil servants in accordance with modern requirements.

Social implications. The results of the research, which are covered in the paper, provide information about the importance of continuous professional development of civil servants, and can also attract the attention of those who plan to hold positions of civil servants in the future.

Originality/value. The authors established that in modern conditions, it is important to use innovative approaches to the professional development of a civil servant in Ukraine. The article examines the peculiarities of drawing up and implementing an individual professional development program of a civil servant, which records individual needs in professional training, and is a tool for planning the professional development of a civil servant.

Keywords: development, professional development, human resources, state authorities, civil servants, competence.

Introduction

In today's conditions of accelerated informatization of society, global innovation processes, strengthening of the innovative content of work, the professional development of human resources is becoming more and more important.

The problem of professional development of the personnel of state authorities in Ukraine became extremely important with the adoption of the Law of Ukraine "On Civil Service" dated December 10, 2015 No. 889-VIII (Law, 2015), the Law of Ukraine "On Education" dated September 9, 2017 No. 2145-VIII (Law, 2017), as well as for their implementation, "On Approval of the Concept for Reforming the System of Professional Training of Civil Servants, Heads of Local State Administrations, their First Deputies and Deputies, Local Self-Government Officials and Local Councils Deputies", approved by Ordinance of the Cabinet of Ministers of Ukraine dated December 1, 2017 No. 974-r (Ordinance, 2017).

It should be noted that in the Strategy for Public Administration Reform in Ukraine for 2022-2025, approved by Ordinance of the Cabinet of Ministers of Ukraine 21 July 2021 No. 831-r (Ordinance, 2021), among the tasks regarding human resource management capacity and organizational culture for the implementation of the "Professional Public Service and Human Resource Management" direction, the implementation of a program of continuous professional development for employees of human resource management services regarding modern practices and management tools is highlighted. In the Strategy (Ordinance, 2021) is also writing about promoting the formation of effective mechanisms for motivating civil servants to professional development and continuous education. The formation of a new model of the system of professional training of civil servants is an integral component of public administration reform, because the successful implementation of public administration reform depends on the professionalism of persons authorized to perform the functions of the state or local self-government, which implies a constant increase in the level of their professional competence (Aliushyna et al., 2021).

Human resource professional development of state administration authorities of Ukraine is an important tool for maintaining an effective system of state administration, especially in times of war. New conditions dictate new challenges, and everyone must learn to respond to them.

Literature Review

Humans are the most valuable resources of modern society. The development and efficiency of both organizations and the country as a whole depends on them. It is human intelligence, knowledge and creativity that move technologies, business processes, and social spheres forward, which confirms the impossibility of effectively using and developing other resources without qualified specialists (Pham Kien Thi and Dung Bui Xuan, 2022).

As Yan Yue (2014) notes, "Human resource management is an important constituent part of enterprise management. Scientific and reasonable management of human resources concerns implementation of enterprise development strategy, enterprise survival and long-term development".

According to Gilley J. W. et al. (2002), "Human resource development is understood as the process of promoting organized learning, improving work performance, and creating changes through the implementation of management solutions (official and non-official), initiatives and activities to enhance organizational capacity, performance, competitiveness and innovation".

According to Morozov and Honchar (2017), human resource development is a continuous process aimed at improving the quality characteristics of employees. This allows not only to increase the efficiency of the organization in the short and long term, but also contributes to the harmonious development of the employees themselves. The key aspects of human resource development are: acquisition of new knowledge and skills necessary for effective performance of current and prospective tasks, increasing motivation and involvement of employees in the organization's activities, formation of loyalty and commitment to the organization. Thus, human resource development is an important strategic direction of human resources management, which allows to reveal and effectively use the potential of employees and ensure long-term competitiveness of the organization.

Tkachenko and Marchenko (2014) define the human resource professional development as a purposeful and systematic influence on employees through the implementation of professional training during their work in the organization with the aim of achieving high efficiency of production or services provided, increasing the competitiveness of personnel on the labor market, ensuring compliance employees of new, more complex tasks based on the maximum possible use of their abilities and potential. The goal of human resource development of any organization is to provide it with well-trained employees in accordance with the goals and development strategy.

Based on the critical analysis and generalization of scientific opinion, scientists (Semykina et al., 2021) propose to define the essence of the concept of "human resource professional development" using a dual approach: a) at the organization level – as a set of measures that ensures continuous updating of professional knowledge and skills of human resources, its adaptation to growing professional requirements, interest in professional growth in the interests of intensification of innovative activities and increasing the competitiveness of the enterprise; b) at the employees level – as a process of continuous development of professional competences based on a combination of self-development with professional training, increasing self-motivation to implement innovative goals of the organization (Semykina et al., 2021).

Polish authors distinguish various classifications of possible employee development projects. Taking into account these classifications, it should be stated that they include such elements as: knowledge, skills, abilities. There are three main groups of employee development instruments, namely: vocational training and improvement of qualifications; employee relocations; work structuring (Wyrzykowska & Karbowiak, 2009).

Human resource development is a process that includes: knowledge enrichment – training, professional development, acquisition of new competencies; development of skills and abilities – improvement of professional and personal skills of employees; formation of motivation – creation of conditions that stimulate employees to work effectively and improve themselves; taking care of physical and mental health – measures to support health, reduce stress, increase job satisfaction. These components make it possible to increase the human capital of individual employees, and therefore the value of the human capital of the entire organization. The main projects aimed at the human resources development can be considered at three levels: 1. The entire organization; 2. Separate work teams; 3. Individual employees (Król, 2014).

Human resource development is one of the task areas of the personnel function and is of interest to both employers and employees. Activities in the field of human resource development should create optimal opportunities for employees' professional development, corresponding to the goals of the organization, and therefore bring benefits to both parties of the employment relationship. It can be implemented based on various strategies and using various tools, including training, employee relocation or career shaping. Human resource development is often perceived in terms of investment (Oczkowska, 2014).

Human resource development is a process strongly involved in the development and subsequent use of human knowledge, taking into account the issue of dynamic individual and organizational changes. Human resource development is a very extensive field of practice and a relatively young scientific discipline (Swanson, 2023).

Human resource development is the engine that can provide the necessary competencies to develop teamwork, problem and process analysis, communication and other needed capabilities (Michael & Viwe, 2009).

McLean and Wang (2007) offer a definition of human resource development as a complex process that includes: the accumulation of knowledge, skills and abilities of people in society (it is investment in human capital, which contributes to economic development); preparing people for active participation in political processes, especially in a democratic society (human resources development expands the opportunities of citizens); promoting social and cultural development, which help people to lead a more fulfilling and rich life, less tied to traditions. In general, the human resource development is a key factor in the modernization of society, opening up new opportunities for personal and social progress (McLean & Wang, 2007).

It should be noted that the issue of human resource development, including professional development is also dedicated the works of Chapman Elizabeth F. et al. (2018); Dreifelde I. and Zakrizevska Belogrudova M. (2021); Marzec Izabela and Austen Agata. (2021); Poell Rob F. and Van der Krogt Ferd J. (2014); Bhaskar P. et al. (2021); Goncharuk N. et al. (2021); Kachan Y. (2019); Bilan Y. et al. (2023).

Scientists note that effective human resource management is key to achieving state goals and ensuring the well-being of citizens. Human resources management in the public sector should be based on the principles of openness, accountability and focus on meeting the needs of citizens (Chapman et al., 2018).

Drucker (2007) draws attention to six factors that influence the productivity of intellectual workers, particularly in public administration. Key factors include: the employee's understanding of the essence of the task and the goals that must be achieved (a clear understanding of the goal and tasks increases the motivation and focus of the employees' efforts); willingness to participate and make an intellectual contribution to management processes (involvement of employees in decision-making and policy-making increases their involvement and initiative); the opportunity to constantly learn and develop (providing conditions for professional growth and self-realization is an important incentive for intellectual employees); the choice of quality methods of work evaluation (a fair and transparent system of evaluation of the work results helps to increase efficiency); working conditions and the internal culture of the organization (a favorable working environment focused on creativity and innovation has a positive effect on productivity). It is worth noting that the specifics of public administration, in particular the limitations and priorities formed by the political and administrative system, can form certain features in the implementation of these factors. This is important to consider when developing effective human resource management mechanisms in the public sector (Andris, 2010).

According to the normative legal acts of Ukraine (Law, 2015) and (Resolution, 2019), professional development is a continuous, conscious, purposeful process of personal and professional growth, based on the integration of knowledge, skills and competencies; professional training – acquisition and improvement of professional knowledge, abilities and skills, which ensures the appropriate level of professional qualification of a civil servant for his professional activity.

Research Findings

According to the National Agency of Ukraine on Civil Service (NAUCS) (NAUCS, 2022), in Ukraine as of June 30, 2023, the actual number of working civil servants was 163 553, of which 41 143 were men and 122 410 were women, 206 civil servants were of category "A", 41 767

– of category "B" and 121,580 – of category "C" (NAUCS, 2022). The number of civil service positions according to the staff list as of June 30, 2023 was 206 206 staff units, in particular category "A" – 283, category "B" – 49 482 and category "C" – 156 441 staff units. 11 108 people are on parental leave, of which 125 are men. The number of people who went abroad as of June 30, 2023 was 2 691 people (at the end of 2022 – 4 355 people), most of whom are women – civil servants of category "B". There are 3 946 civil servants serving in the Armed Forces of Ukraine, of which 3 301 are men and 645 are women (NAUCS, 2022).

Civil servants of the state authorities of Ukraine constantly increase their level of professional competence during their service.

The reform of the professional training system ensured the introduction of many innovations in this field and the development of an innovative training model for civil servants, heads of local state administrations, their first deputies and deputies, local self-government officials and deputies of local councils, which is aimed at continuity, obligation, planning, practical orientation, predictability of training and compliance with the needs of its participants (Strategy, 2023).

Table 1: Quantitative and qualitative composition of employees of state authorities of

Ukraine, as of June 30, 2023*

Indicator	Categories of positions			In total
	A	B	C	
The number of positions according to the staff list	283	49482	156441	206206
The actual number of employees, persons	206	41767	121580	163553
Occupied positions, %	72.79	84.41	77.72	79.32

Note. *Calculated by: (NAUCS, 2022).

The organizational principles of the professional training system functioning of the public authorities employees are determined by the Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Regulation on the System of Professional Training of Civil Servants, Heads of Local State Administrations, their First Deputies and Deputies, Local Self-Government Officials and Deputies of Local Councils" dated February 6, 2019 No. 106 (Resolution, 2019). According to this Resolution, civil servants undergo advanced training at least once every three years. The need for professional training of a civil servant is determined by his immediate supervisor and the human resource management service state authority based on the results of evaluation of official activity.

Professional training of civil servants is carried out through the system of educational institutions, agencies, organizations, regardless of the form of ownership, which have the right to provide relevant educational services, and is carried out at the expense of state and local budgets, other sources not prohibited by law.

The structure of the professional training system includes: customers of educational services in the field of professional training; subjects of the provision of educational services in the field of vocational training (providers) and self-regulatory professional associations (professional associations, professional networks) of subjects of the provision of educational services in the field of vocational training (providers) (Resolution, 2019).

Based on the results of professional training, civil servants and local self-government officials are awarded ECTS credits, which are subject to accounting maintained by human resource management services. Civil servants within the scope of implementation of individual programs and officials of local self-government must collect at least one ECTS credit during the calendar year. Civil servants can exercise their right to professional training through the forms shown in Fig. 1.

Forms of professional training of civil servants	
Preparation – successful completion by participants of professional training of the appropriate educational and professional program, which is the basis for awarding a degree of higher education at the master's level in the specialties necessary for professional activity in the civil service and service in local self-government bodies, in particular, in the specialty 281 "Public Management and Administration» field of knowledge "Public management and administration"	*Improvement of qualifications – acquisition by participants of professional training of new and/or improvement of previously acquired competences within the limits of professional*
	Internship – acquisition by the participants of professional training of practical experience in performing tasks and duties in a professional
	Self-education – self-organized acquisition of certain competencies by participants of professional training, in particular during everyday activities related to professional, social or other activities, leisure

Fig. 1. Forms of professional training of civil servants

Note. Developed by: Resolution, 2019

According to the Resolution of the Cabinet of Ministers of Ukraine (Resolution, 2019), the amount of self-education among other types of professional training within the scope of the

implementation of an individual program should be at least 10 and no more than 20 percent of the total number of ECTS credits received according to the results of the program execution. According to the results of self-education for a civil servant the ECTS credits are accrued in the prescribed manner of NAUCS.

Professional training of civil servants can be carried out through self-education in the form of online learning on educational web platforms, participation in conferences, scientific and practical conferences, professional seminars, trainings, master classes, courses on mastering practical skills, etc. (Fig. 2).

ONLINE SERVICES FOR TRAINING WITHIN FRAMEWORK OF SELF-EDUCATION

DIGITAL EDUCATION

- Cyber fraudsters;
- Basics of cyber hygiene;
- Cybernetics;
- Personal data;
- Safety of children on the Internet.

OUM ONLINE

- First psychological aid in emergency and crisis situations;
- Information security in the digital world;
- Digital security and online communication;
- Volunteer teams: dream or reality.

YOUTUBE

- Internal communications in wartime: a lecture about HR;
- How **to** motivate and empower a team during war;
- Psychological assistance during the war;
- How to organize the work of employees during martial law?
- As increase the effectiveness of remote work;
- Critical thinking during war;
- How to find inner strength during war;
- Emotions of war;
- Home medical assistance in wartime conditions for civilians;
- A series of webinars "Reality without Illusions" from the UCU Business School and the UCU Leadership Center about crisis leadership, resilience, limited resources, actions of business and HR specialists in unstable times.

PROMETHEUS
- Psychology of people during the war: how to live and work in new realities;
- Information hygiene. How to recognize lies in social networks, on the Internet and on television;
- Disinformation: types, tools and methods of protection;
- Information wars;
- Remote work for public servants.

EDERA (EDUCATIONAL ERA)
- Specialized course for civil servants and persons who work with personal data;
- Dialogues without anxiety. An online course on various ways to overcome anxiety;
- Factcheck: trust-check.

EDUCATIONAL HUB

- Internet security;
- First aid;
- Modern Ukrainian language;
- Critical thinking and information culture;
- Time-management in public administration;
- Anti-crisis management in public administration.

Fig. 2. Online services for training within the framework of self-education

Note. Developed by: NAUCS, 2023

Blagovesna Yovkova and Roumiana Peytcheva-Forsyth (2023) emphasize that a large-scale digital transformation of continuous education is observed all over the world, including in state administration at all levels, through the implementation of various forms of e-learning. Advanced training of civil servants is carried out according to programs, which are divided into general and special according to the content of training (Fig. 3).

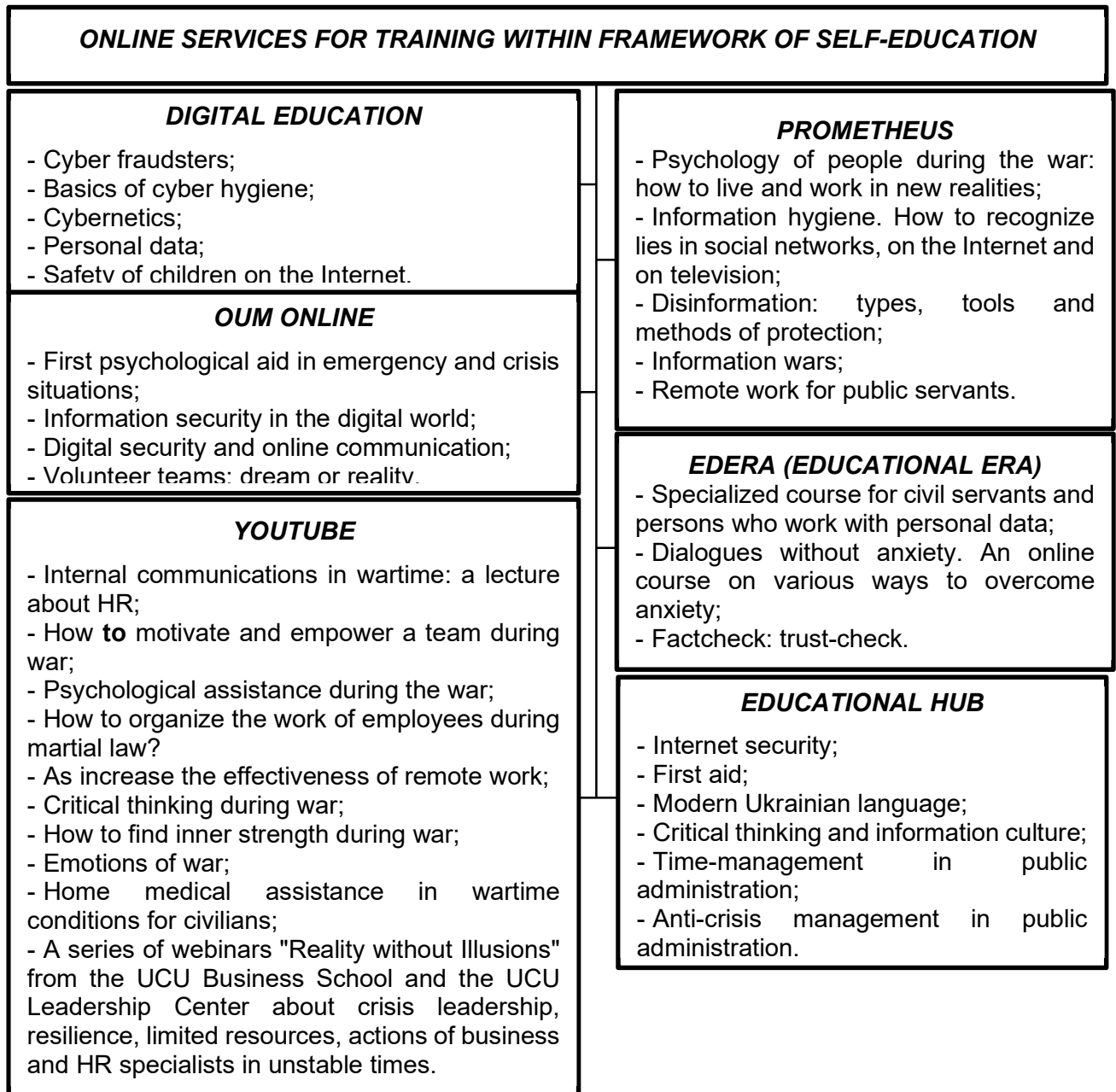| **Improving the qualifications of civil servants**	
General professional development programs, the content of which includes: - general issues of state administration and local self-government; - issues of prevention the corruption; - changes in legislation on civil service, service in local self-government bodies; - issues of European and Euro-Atlantic integration; - issues of ensuring equal rights and opportunities for women and men; - ensuring cyber security; - increasing the level of mastery of a foreign language, which is the official language of the Council of Europe, the state language; - other issues determined by relevant state, regional, local programs and strategies.	*Special training programs, the content of which are:* - covers the issues of the implementation of tasks, functions and powers by a separate state authority (authorities), local self-government authority (authorities), - takes into account the peculiarities of the performance by the participants of professional training their official duties in the relevant field of professional activity.

Fig. 3. General and special programs for improving the qualifications of civil servants

Note. Developed by: Resolution, 2019

According to the Procedure for evaluating the results of official activities of civil servants (Resolution, 2017), on the basis of the tasks and key indicators defined for the civil servant, the needs for professional training (if they are determined), as well as based on the results of the evaluation of the civil servant's official activity (if available), such civil servant together with the human resource management service draws up an individual promotion program level of professional competence/individual program of professional development. An individual program is drawn up within no later than ten working days after defining the tasks and key indicators for the civil servant (Resolution, 2017). An individual professional development program is a document that defines the individual needs of a participant in professional training, the form and types of such training (Resolution, 2019).

The normative principles of drawing up an individual professional development program are:

- Law of Ukraine "On Civil Service" (Law, 2015);

- Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Regulation on the System of Professional Training of Civil Servants, Heads of Local State Administrations, their First Deputies and Deputies, Local Self-Government Officials and Deputies of Local Councils" dated February 6, 2019 No. 106 (Resolution, 2019);

- Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Procedure for Conducting an Evaluation of the Results of Civil Servants Activity" dated August 23, 2017 No. 640 (Resolution, 2017);

- Order of the NAUCS "On the Approval of Methodological Recommendations for Compiling, Reviewing and Monitoring the Implementation of an Individual Program for Increasing the Professional Competence Level of a Civil Servant (Individual Professional Development Program)" dated October 26, 2020 No. 201-20 (Order, 2020);

- Order of the NAUCS "On Amendments to the Methodological Recommendations for Compiling, Reviewing and Monitoring the Implementation of an Individual Program for Increasing the Professional Competence Level of a Civil Servant (Individual Professional Development Program)" dated December 14, 2022 No. 131-22 (Order, 2022).

The individual program is recommended for the purpose of planning the professional development of a civil servant, aimed at acquiring and improving his professional knowledge, abilities and skills, which ensure the appropriate level of professional qualification for his professional activity in the position held in accordance with the established job duties. Professional training needs are defined in the form of professional competences that must be acquired or improved by a civil servant.

The individual program is drawn up by the civil servant together with the human resource management service based on the results of the evaluation the official activity of civil servant (if available) during the evaluation interview (if conducted) by the civil servant together with the person who conducts the evaluation interview in accordance with clauses 23, 39 of the Evaluation Procedure, the needs of professional training for the next year are discussed and determined, taking into account the results of such civil servant's performance of the approved tasks and key indicators in the reporting period.

The form of individual professional development program is provided by the annexes to the Evaluation Procedure.

The individual program of a civil servant who holds a civil service position of category "A" is approved by the person who determined the tasks and key indicators for such civil servant (clause 20-1 of the Evaluation Procedure). The individual program of a civil servant who holds

a civil service position of category "B" or "C" is agreed by the direct manager of such civil servant and approved by the head of the independent structural unit in which he works (if available) (clause 34-1 of the Evaluation Procedure) (NAUCS, 2023).

When drawing up the individual program of a civil servant, it is recommended to take into account the needs of professional training, determined by the results of the evaluation the official activity of civil servant, tasks and key indicators for the next year and requirements (Fig. 4).

In the Methodological Recommendations for Compiling, Reviewing and Monitoring the Implementation of an Individual Program for Increasing the Professional Competence Level of a Civil Servant (Individual Professional Development Program), approved by the order of the NAUCS dated October 26, 2020 No. 201-20 (Order, 2020) stated that it is recommended to monitor the implementation of the individual program in order to ensure proper implementation of the individual program by the civil servant.

Requirements that must be taken into account when drawing up an individual program of professional development of a civil servant

mandatory advanced training for civil servants under general and/or special professional (certificate) programs: first appointed to a civil service position within a year from the date of their appointment; who hold civil service positions, at least once every three years;

mandatory advanced training for civil servants under general and/or special short-term programs at least once every three years;

the need for a civil servant to collect at least one ECTS credit during the calendar year within the implementation of an individual program;

setting the share of self-education among other types of professional training within the implementation of an individual program of 0.1 - 0.2 ECTS credits, unless otherwise provided by the Regulation on the system of professional training.
In 2023, the share of self-education within the implementation of an individual program may amount to no more than 0.5 ECTS credit.

Fig. 4. Requirements for drawing up an individual program of professional development of a civil servant,

Note. Developed by: NAUCS, 2023 & Order, 2020

It is recommended to monitor the performance of an individual program by a civil servant of category "B" or "C" by the immediate head together with the civil servant, with subsequent informing of the human resource management service about the results of such monitoring.

In the case of direct subordination of a civil servant to the head of the civil service, such monitoring is recommended to be carried out by the human resource management service the relevant state authority.

According to the results of the summarization of individual programs, every year no later than December 20, state bodies send the NAUCS information about the professional training needs of civil servants who hold civil service positions of categories "B" and "C", and no later than January 15 – copies of individual programs for improving the level of professional competence civil servants holding civil service positions of category "A".

In 2023, NAUCS and specialists of the PO "Ukrainian Institute of Social Research named after Oleksandr Yaremenko " with the assistance of the Norwegian Center for Integrity in the Defense Sector (CIDS) conducted a study of organizational culture "Public service in Ukraine: your point of view". The research was implemented using an anonymous online survey, in which 43 862 public servants participated, including 39 557 civil servants and 4 305 local government officials, who answered most of the survey questions and provided personal information about gender, age, seniority and had a contradiction in the declared work experience and age. The study made it possible to find out how public servants evaluate the prerequisites for professional growth – personal and of their colleagues. Respondents rate their own qualifications the highest. Almost all respondents (94.3%) "fully agree" or "agree" with the assessment thesis that their qualifications, professional training and acquired education are sufficient for the current job (Fig. 5).

Almost half (42.4%) of the respondents "fully agree" with the thesis that their qualifications and acquired education are sufficient to perform the current job, and this is a high indicator. On the one hand, this assessment by public servants of their own professional knowledge and skills gives rise to optimism about the prospects for their growth as specialists. On the other hand, excessive self-confidence, overestimation of one's own capabilities can become an obstacle on the way to self-improvement, restrain the demand for new knowledge.

The sufficiency of the existing qualifications and education for the performance of job duties was indicated more often (compared to the average indicator) by respondents who have a PhD degree ("fully agree" or "agree" – 98.1%). A similar indicator is significantly lower than the average among novice employees with one year of work experience and less (86.3%), among employees with a bachelor's degree or less (89.4%). In other words, the representatives of the specified groups show the need for advanced training and additional education.

If the respondents characterize their own qualifications and education very positively, then the dynamics of professional growth are assessed more modestly. Among all respondents, 78.9%

"fully agree" or "agree" with the assessment thesis "I grow professionally while working in my public authority". In comparison, beginning employees with one year of work experience or less describe their own professional growth at their place of work more positively (85.7% somewhat agree with the thesis). However, respondents with higher work experience are more critical of their own progress.

Three quarters (77.5%) of respondents somewhat agree with the assessment that " My public authority takes care of the professional development of its employees".

At the same time, 7.7% of respondents "do not agree at all" or "disagree" with the evaluation thesis.
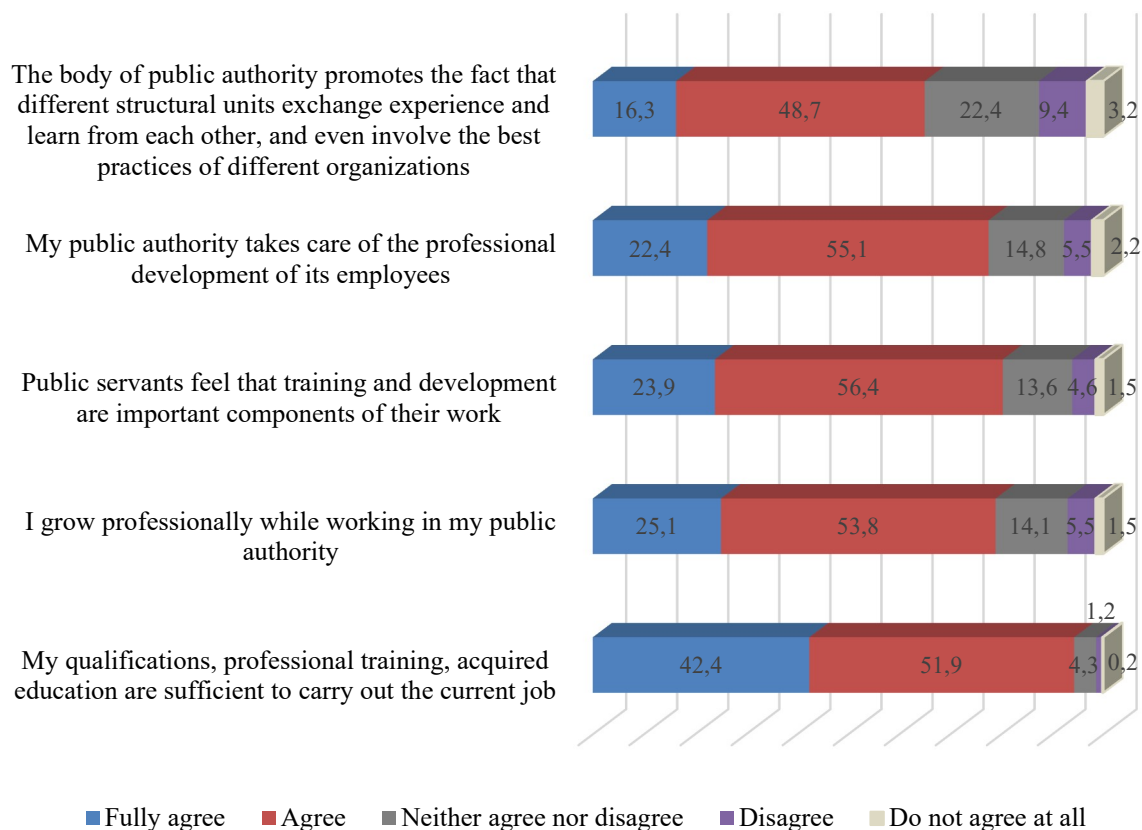
Fig. 5. Distribution of respondents answers to the question: "To what extent do you agree or disagree with this statement?"

Source: Analytical report NAUCS, 2023

Respondents with a scientific degree are the most critical of how institutions take care of the professional development of their employees. Among respondents with a candidate of science degree, 11.5% somewhat disagree with the stated thesis, and among doctors of science – 10.6% of respondents. 80.3% of respondents "fully agree" or "agree" with the thesis "Public servants feel that training and development are important components of their work". The rest

of the respondents are not so sure about this. The awareness of the importance of training is especially positively assessed by novice employees with less than a year of work experience (85.8%), as well as employees with a bachelor's degree or lower (86.3%). These respondents broadcast their own interest (request) in training to their colleagues.

Public servants are the most restrained in their assessment of how experience exchange and implementation of best practices are carried out at their place of work. Two-thirds (65.0%) of the respondents somewhat agree with the thesis "The body of public authority promotes the fact that different structural units exchange experience and learn from each other, and even involve the best practices of different organizations". A significant share (12.6%) of the respondents gave negative answers – somewhat disagreed with this assessment. Critical assessments were most often expressed by young employees aged 20–35, as well as respondents with a doctor of science degree. Therefore, the implementation of best practices does not always meet the required level, and the mutual exchange of experience is an urgent request of public servants.

In 2023 the medium-term forecast indicators of the general needs for professional training of the participants of professional training (hereinafter – general needs for professional training) for 2024-2026 have been determined by the NAUCS (Report, 2023).

The generalized needs of civil servants, officials of local self-government, first deputies and deputy heads of local state administrations in the preparation of masters in the specialty "Public Management and Administration" for 2024-2026 amount to 8 531 people. The analysis of the needs for the training of masters in the specialty "Public Management and Administration" for 2024-2026 (see Fig. 6) indicates a decrease in the volume of such needs from 3 347 people in 2024 to 2 537 people in 2026.

The needs for improving the qualifications of participants in professional training under general professional (certificate) and short-term programs (hereinafter – general programs) for 2024-2026 amount to 785 187 people, of which: under general professional (certificate) programs – 166 804 people; under general short-term programs – 618 383 people.

The "top-5" most priority areas of professional development for civil servants and local self-government officials have been determined by the NAUCS (Fig. 7). The "top-5" priority areas account for 51.7% of the total volume of civil servants needs for advanced qualifications under general short-term programs.

The chart shows data for years 2024, 2025, and 2026:

2026: (2537 person)
- Heads of Local State Administrations: 40
- Local Self-Government Officials: 881
- Civil servants of local state administrations: 282
- Civil servants of territorial bodies of state authorities: 983
- Civil servants of state authorities: 351

2025: (2647 person)
- Heads of Local State Administrations: 37
- Local Self-Government Officials: 973
- Civil servants of local state administrations: 279
- Civil servants of territorial bodies of state authorities: 1001
- Civil servants of state authorities: 357

2024: (3347 person)
- Heads of Local State Administrations: 36
- Local Self-Government Officials: 1293
- Civil servants of local state administrations: 353
- Civil servants of territorial bodies of state authorities: 1156
- Civil servants of state authorities: 509

Total: 8531 persons

- Heads of Local State Administrations, their First Deputies and Deputies
- Local Self-Government Officials
- Civil servants of local state administrations
- Civil servants of territorial bodies of state authorities
- Civil servants of state authorities

Fig. 6. Needs for the preparation of master's degrees in the specialty "Public management and administration" for 2024-2026 by categories of professional training participants, persons, Sourc: Report, 2023

- cyber security: 50877
- change management: 55913
- digital literacy: 65878
- improving the level of mastery of the state language: 71220
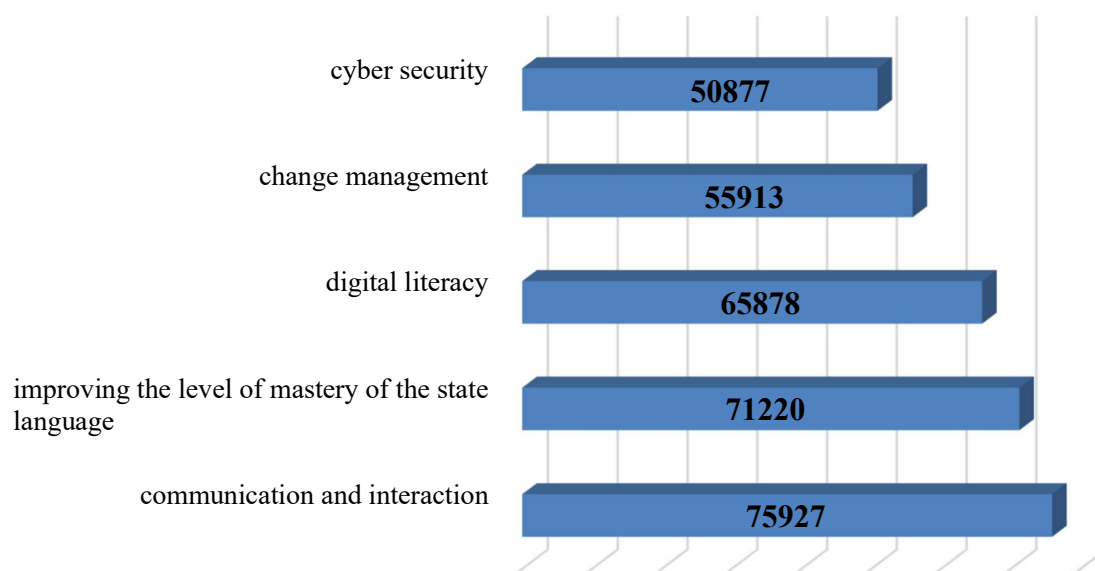- communication and interaction: 75927

Fig. 7. Top-5 areas of professional development according to the general short-term programs, persons, Source Report, 2023

It should be noted that advanced training programs must meet the criteria of modernity, innovation, be relevant and provide answers to practical requests of participants. Currently, training programs on behavior in crisis situations and development of leadership qualities are becoming more relevant.

In the Strategy (Strategy, 2023), approved by the Coordination Council at the National Agency of Ukraine on Civil Service defined the goals and objectives of the development the system of professional training of public servants for the period 2024-2027.

Ordinance of the Cabinet of Ministers of Ukraine dated December 27, 2023 No. 1206-r approved the plan of measures for the development of the system of professional training of civil servants, heads of local state administrations, their first deputies and deputies, officials of local self-government and deputies of local councils until 2027 (Ordinance, 2023).

The main focuses of the government ordinance are: digitization of services and management processes in the field of professional training; increased attention to the quality of professional development of public servants; ensuring the inclusiveness of the professional training system; regular assessment of the status of professional training system (according to the system of management indicators) and monitoring of the quality of professional training; development of professional competences of public servants in matters of preventing the emergence of threats and the onset of crisis situations; introduction of mobility programs for the internship of civil servants abroad; learning foreign languages, in particular summer/winter English-language schools for civil servants; dialogue meetings with representatives of international and foreign institutions, organizations, specialists in the field of public service and adult education (Plan, 2024).

The training of public servants should be aimed at acquiring and improving modern professional competencies necessary for the post-war recovery and development of Ukraine, building a capable service and digital state.

Conclusions

An important role in ensuring the successful operation of state authorities is played by the development of human resources, which should be carried out systematically and aimed at achieving certain goals. As a result of the analysis of the scientific literature, it was established that the development of human resources is a process that includes a set of measures for improving the knowledge and behavior of employees related to professional activity, using a wide range of professional training methods to ensure the goals of the organization, and for growth professional competencies of employees based on self-development.

Vocational training is a necessary component of human resources development, which helps civil servants acquire and improve professional knowledge, abilities and skills, which ensures the appropriate level of their professional qualifications for professional activities. Taking into

account modern conditions, a special role among the forms of professional training of civil servants belongs to online services for training within the framework of self-education.

The vast majority of civil servants to some extent positively characterize the prerequisites for professional growth: having the knowledge and skills necessary for the performance of work, personal progress in the professional plan at the workplace, awareness of the need for training by colleagues, the availability of experience sharing practice, creation of conditions in the organization for professional development as a whole.

Public servants' high assessment of their own professional knowledge and skills gives rise to optimism about the prospects for their growth as specialists. At the same time, it is important to have an objective assessment of the suitability of the knowledge and skills of employees to the tasks facing the organization. It was determined that the most priority areas of professional development for civil servants and local self-government officials include: cyber security, change management, digital literacy, improving the level of mastery of the state language, communication and interaction.

The experience of developing human resources in the state authorities of other countries, in particular Poland, can be useful for maintaining the capacity and functionality of the civil service of Ukraine. The study of the peculiarities of the training of civil servants in developed countries, the mutual exchange of experience is an urgent request for the development of decisions regarding the modernization of the professional development of civil servants in Ukraine.

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Exploring Workplace Mental Health Amid Digital Transformation: A Management Science Overview

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Extended Abstract

The adoption of digital technology and its effects on mental health have increasingly drawn attention from researchers worldwide, particularly within the field of management. The intersection of these two pivotal concepts, digitalization and mental well-being, is the central theme of this manuscript. In an era marked by rapid technological advancements, understanding the implications of digital transformation on employee mental health has become crucial for organizations striving to maintain productivity and a healthy workforce.

Context: This study aims to synthesize both empirical and theoretical research on the integration of digital technologies in organizational settings and their impact on mental health. Our goal is to provide an in-depth overview of the current state of knowledge, identify key trends, and highlight the challenges and opportunities associated with the digitalization of the workplace. The review focuses specifically on the period between 2010 and 2022, encompassing 43 manuscripts from Scopus-indexed journals. These studies offer a robust basis for understanding the complex relationship between digital technology adoption and employee well-being.

The economic landscape has significantly changed with the rise of digital technologies, transforming industries and organizations globally. As businesses increasingly adopt digital tools for communication, work processes, and management, the workforce is confronted with new challenges related to stress, anxiety, and job demands. While the potential benefits of digitalization—such as increased efficiency, remote work flexibility, and data-driven decision making—are undeniable, they also introduce new risks to mental health, particularly in relation to technostress and burnout. This juxtaposition between the benefits and challenges forms the critical backdrop for the ongoing conversation about digital transformation and employee well-being.

Methodology: To address this issue, we conducted a literature review following a rigorous protocol. Our primary objective was to analyze existing research published in well-regarded, Scopus-indexed journals. Using a comprehensive search strategy across multiple databases, including Google Scholar, Science Direct, and Scopus, we applied Boolean operators to identify relevant studies on the adoption of digital technologies and their impact on mental health in organizational settings.

The search terms used included:

- *("digital technology adoption" OR "digital transformation") AND ("mental health" OR "psychosocial risks") AND ("management" OR "workplace well-being")*
- *("digital technology" AND "workplace stress") OR ("technostress" AND "employee well being") AND ("organization" OR "management science")*
- *TITLE-ABS-KEY(("digital technology" OR "digital transformation") AND ("mental health" OR "psychosocial well-being") AND ("management" OR "organizational behavior"))*
- The final selection included 43 peer-reviewed articles, which were thoroughly analyzed to synthesize findings and identify key patterns.

Results: Our analysis revealed several important themes and insights into the relationship between digital technologies and mental health in organizational settings. A key finding is the prominent role of mobile applications designed to help employees manage mental health issues, particularly anxiety and technostress. These digital tools are becoming increasingly popular for offering real-time support and monitoring, but their effectiveness varies depending on individual preferences and technological fluency.

Furthermore, we found that the benefits of digital technologies—such as enhanced flexibility, remote work opportunities, and improved access to information—are tempered by the challenges they pose to employee well-being. The phenomenon of technostress, or stress caused by the overuse of technology, has emerged as a significant concern. Employees, especially those without proper training or support, can experience heightened anxiety and feelings of overload due to constant connectivity and the pressure to adapt to ever-changing digital tools.

The study also underscores the importance of organizational strategies for mitigating these challenges. Companies that implement digital literacy training, provide mental health resources, and establish boundaries for technology use after working hours are better equipped to support their employees' well-being. These findings suggest that organizations must take proactive steps to balance the advantages of digital transformation with the mental health needs of their workforce.

Conclusion: The adoption of digital technology in the workplace presents both opportunities and challenges for employee mental health. While these technologies can enhance productivity and improve work-life balance, they also introduce new risks related to stress, anxiety, and burnout. Our review highlights the importance of developing comprehensive strategies to manage these risks, including training, mental health support, and clear boundaries around technology use. Future research should continue to explore how organizations can foster a healthy digital work environment that maximizes the benefits of technology while safeguarding the well-being of employees.

Key Words: Digital technology, mental health, workplace stress, technostress, digital transformation, organizational behavior, systematic review.

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Exploring the Role of Culture in Leadership Styles and Deviance Credit

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Purpose

In the 20th Century, Geert Hofstede's Theory of Cultural Dimensions (1984) established a foundational framework for understanding how culture influences various phenomena, including leadership. Since then, it has become a crucial tool for cross-cultural research, especially in areas like management and decision-making, where cultural values significantly shape organizational behaviour (Gelfand et al. 2017). One key dimension identified by Hofstede is the distinction between individualism and collectivism, which provides insight into how people from different cultures prioritize personal versus group goals. Regarding the group orientation of one culture, assumptions can be made, and conclusions can be drawn about the characteristics of the society. Fox (2010) argues that there are discrepancies in the dimensions of caregiving, communication, identity, education, work life, task orientation and many others. Given the statuses of the societies in these dimensional spectrums, one can assume that this might be the case for the organizations inside those societies to be governed by similar principles because they are operated by people whose perspectives on work life and leadership were influenced by that society since they were born. This study aims to extend our knowledge by examining the connection between cultural orientation (Individualism vs. Collectivism) and preferred managerial leadership styles (Autocratic vs. Democratic) in two distinct countries: the United Kingdom and Türkiye with the nuanced theoretical support of a recently developed concept called Deviance Credit.

Theoretical Framework

The concept of Deviance Credit, developed by Abrams et al. (2018), introduces a fresh perspective on how followers perceive and tolerate deviations from expected behaviour by leaders. It suggests that leaders may accumulate "credit" through their adherence to workgroup norms with their prototypicality (Accrual) and their right to be supported from the followers' perspectives as a leader, which is mainly about how well they can fill the leadership role (Conferral). In this line of thinking, this perspective is reprised of the leadership status and stereotypes. These mechanisms of Accrual and Conferral in turn allows them to engage in actions that might otherwise be viewed as non-conforming, allowing leeway for them when leaders try to innovate by implementing change or behave transgressive. These levels increase as the leader become a more model member of the group and is invested to the role. With the effect of leadership stereotypes members assume that the leader is more competent

than other members merely due to the occupation of the leadership position. (Lord & Hall, 2003) Demonstrating that these concepts contribute to the leader's ability to deviate is particularly important because it helps us comprehend the underpinnings of the thought processes of members to make change happen. In addition, it builds on the previous knowledge we have on in-group dynamics and how individuals in groups respond to each other in cases of deviance thereby, advancing the Social Psychology and Management literatures. This concept also aligns closely with the theme of intuitive management, as it highlights the subtle, often unconscious judgments that followers make about their leaders' behaviour, based on their cultural expectations and the leadership style in place.

Methodology and Results

This study hypothesizes that the leadership style favoured by a given culture will grant more deviance credit to leaders practicing that style. Specifically, we explored the relationship between cultural orientations of individualism (as seen in the UK) and collectivism (as seen in Türkiye) and the preference and allocation of deviance credit to autocratic versus democratic leaders which are presented through leadership vignettes created by Kolorov (2018) for Harvard Business Review. Through surveys which are the Leadership Preference Scale (Bhushan, 1995) and Deviance Credit Scales (Abrams, 2018) given to participants from both countries (52 participants each), we found that, regardless of cultural orientation, participants were more inclined to prefer and grant deviance credit to democratic leaders over autocratic ones. This challenges the assumption that collectivist cultures, which emphasize group harmony and authority, would be more tolerant of autocratic leadership. Similarly, participants from the society with individualistic tendencies showed a clear preference for democratic leaders, as they valued transparency, shared decision-making, and accountability. Furthermore, considering those democratic leaders who involve their team in decision-making processes suited the leadership position better than the autocratic leader according to the perspective of the individualistic participants, they granted them more deviance credit. Additionally, in both conditions democratic leaders were evaluated highly both on competency and willingness to work for the leader.

Discussion and Conclusions

These findings have several implications for intuitive management and decision-making. First, they suggest that cultural expectations for leadership styles can influence not only explicit judgments but also more subtle, intuitive assessments of leader behaviour. Managers who understand and align their leadership style with the preferences of the workgroup they are leading independent of the cultural predisposition may be granted more leeway in their decision-making processes, even when deviating from established norms. Second, the

preference for democratic leadership across both individualistic and collectivistic cultures points to a shift in global leadership values which gets increasingly visible over the years, where participative and inclusive decision-making is favoured (Yukl, 2013).

Furthermore, the concept of deviance credit highlights how followers' intuitive judgments can affect a leader's capacity to implement unconventional or risky decisions. This aligns with research on intuitive decision-making, which emphasizes how managers rely on tacit knowledge and culturally grounded assumptions when making choices in uncertain situations (Hodgkinson & Sadler-Smith, 2018). Leaders who are attuned to the expectations of their teams may be more successful in navigating complex and dynamic environments, leveraging their deviance credit to make bold, innovative decisions without facing backlash.

In conclusion, this study contributes to the literature on leadership and cross-cultural management by exploring the intersection between cultural dimensions and the emerging concept of deviance credit. The findings suggest that, regardless of cultural orientation, democratic leadership is increasingly associated with greater tolerance for deviation, providing leaders with more flexibility in their decision-making processes. This has significant implications for intuitive management practices, where understanding and leveraging cultural expectations can enhance leadership effectiveness in diverse organizational settings. Future research could explore how these dynamics play out in other cultural contexts, dimensions and examine the long-term impact of deviance credit on leadership success.

Key Words: leadership, leader deviance, leader transgressions, deviance credit, cultural dimensions, individualism-collectivism, intuitive management, decision-making, innovation, United Kingdom, Türkiye, cross-cultural management.

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The Growth of Indian Aquaculture

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Introduction

India's agricultural and aquaculture sectors have undergone significant transformations through various revolutions. The *Green Revolution* of the 1960s increased food grain production through high-yielding variety seeds and modern farming techniques, ensuring food security. The *White Revolution*, initiated in 1970, revolutionized the dairy industry, making India the largest milk producer globally. Building on these successes, the *Blue Revolution*, launched during the Seventh Five-Year Plan (1985-1990), aimed to enhance fish production, and modernize the fisheries sector through advanced aquaculture techniques, sustainable practices, and improved infrastructure.

The Indian aquaculture market reached a size of 13.4 million tons in 2023 and is projected to grow to 26.4 million tons by 2032, with a compound annual growth rate (CAGR) of 7.97% during 2024-2032. Key regions such as South India, particularly Andhra Pradesh and Tamil Nadu have emerged as key regions due to favourable climatic conditions and extensive coastal areas. East India, with states like West Bengal and Odisha, also plays a significant role, especially in freshwater fish production. Emerging regions include Gujarat and Maharashtra in the west for brackish water aquaculture, and the Indian Sundarbans, are also being recognized for their potential in coastal aquaculture.

The Indian aquaculture market is characterized by a diverse range of species, including shrimp, carp, and catfish. Domestic consumption is driven by increasing health consciousness and dietary shifts towards protein-rich foods. The market dynamics are influenced by factors such as consumer preferences, regulatory policies, and technological advancements. The sector is also witnessing consolidation, with larger players investing in vertically integrated operations to achieve economies of scale and improve supply chain efficiency.

Methodology

The aquaculture sector in India has emerged as a pivotal component of the nation's economy, contributing significantly to Food security, Employment, and Exports. This paper aims to provide a comprehensive analysis of the current state of this Sunrise Sector, focusing on its

economic impact, sustainability, technological innovations, government subsidiary schemes and investment opportunities. The data sources include literature review and the opinions of several academicians/researchers.

Discussion

Economic Impact

Aquaculture in India has shown remarkable growth, becoming a major source of income for coastal and rural communities. The sector contributes approximately 1% to the national GDP and provides employment to over 25 million people. The economic benefits extend beyond direct employment, influencing ancillary industries such as feed production, processing, and logistics. The multiplier effect of aquaculture on the local economy underscores its importance in regional development and poverty alleviation.

Today, Norway and China are among the top 3 countries in terms of Aquaculture exports with India being the 5th largest global exporters of aquaculture products, with shrimp being the primary export commodity. The export market is buoyed by strong demand from the United States, European Union, and Southeast Asia. However, the sector faces challenges such as stringent quality standards, trade barriers, and competition from other exporting countries. Enhancing export potential requires addressing these challenges through improved quality control, certification, and compliance with international standards. In 2023, India's aquaculture exports were valued around 8 billion USD, with shrimp exports accounting for more than half of the total export value and around 75% export quantity.

Sustainable and Technological Practices

Sustainability in aquaculture is crucial to ensure long-term viability and environmental health. Indian aquaculture faces challenges such as water pollution, overfishing, and habitat destruction. However, there has been a significant shift towards adopting sustainable practices. These include the use of Biofloc Technology (BFT), Integrated Multi-trophic Aquaculture (IMTA), and organic farming methods. Sustainable practices not only mitigate environmental impacts but also enhance the quality and marketability of aquaculture products. As of 2023, approximately 20% of the aquaculture farms in India have integrated BFT into their operations with productivity and reduction in water consumption being key drivers. The adoption of IoT in aquaculture is revolutionizing the industry by enabling real-time monitoring and management of aquaculture operations. IoT devices such as sensors and automated feeders provide critical data on water quality, temperature, and feed usage. This data-driven approach enhances productivity, reduces waste, and ensures optimal growing conditions. The integration of IoT also facilitates traceability and transparency, which are increasingly

demanded by consumers and regulators. As of 2023, approximately 15% of aquaculture farms in India have integrated IOT based technologies which has led to enhanced monitoring, automation and data driven decision making to ultimately improve productivity and sustainability.

Government Subsidiary Schemes and Investment Opportunities

Following the examples of countries like Saudi Arabia which has directed a large amount of their Sovereign Fund (PIF) towards the agenda of Food Security as part of Saudi 2030 Vision, the Indian government has also launched several initiatives to support the growth of the aquaculture sector. The Pradhan Mantri Matsya Sampada Yojana (PMMSY) is a flagship scheme with an investment of INR 20,050 crore for the period 2020-2025, aiming to increase fish production by 7 million metric tons and boost exports to USD 12 billion. Additionally, the Fisheries and Aquaculture Infrastructure Development Fund (FIDF), with a fund size of INR 7,522.48 crore, provides concessional finance for creating fisheries infrastructure. These schemes are expected to create 5.5 million additional employment opportunities and significantly enhance the sector's infrastructure.

Apart from the economic potential, Indian government's motive to boost aquaculture through its policies is rooted in supporting many of the sustainability development goals outlined by the United Nations. Key SDGs outlined is SDG 1 (No poverty), SDG 2 (Zero Hunger), SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), SDG 14 (Life Below Water) and SDG 15 (Life on Land).

Conclusion & Implications:

The Indian aquaculture sector holds immense potential for growth and development. By integrating economic impact, sustainable practices, market dynamics, export potential, advanced technologies like IoT, and government support through subsidiary schemes and investment opportunities, the industry can achieve sustainable and inclusive growth. Strategic interventions and policy support are essential to address challenges and harness opportunities, ensuring that Indian aquaculture continues to thrive in the global market. The continued evolution from traditional practices to modern, technologically driven approaches will be key in positioning India as a global leader in this Sunrise Sector.

Keywords: Indian aquaculture market, economic impact, sustainability, technological innovations, government subsidiary schemes and investment opportunities.

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Algebraic System as Key Concept of Textual Data Analysis of Change Management

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Extended Abstract

Organizations and managers of Ukraine faced to the problems find out clear solution in order to overcome obstacles under wartime condition. It was observed that managers tried to solve issues more quickly, but the responses were generally disorganized. These situations have proved the necessity to have alternative scenarios or a base of precedent decisions for further future development. The creation base of precedent decisions requires clear information about potential case solving.

In times of crisis or change, this situational leadership approach becomes paramount. By actively supporting individuals and facilitating their engagement, managers can mitigate fears and uncertainties, fostering a conducive environment for change implementation. Such as the current situation must be described, Lauri Tabur has proposed the next approach (see table 1).

Table 1. The Example Case Solving by a Group of Ukrainians

CASE About a Company and Its Real Situation in Ukraine During The War:	
/// ///	
FEAR	**MITIGATION ACTIVITY**
1. ///////////////////////////////////////	1. ///////////////////////////////////////
2. ///////////////////////////////////////	2. ///////////////////////////////////////
3. ///////////////////////////////////////	3. ///////////////////////////////////////
4. ///////////////////////////////////////	4. ///////////////////////////////////////
……………………………..	……………………………………
n. ///////////////////////////////////////	n. ///////////////////////////////////////
n+1. ///	n+1. ///////////////////////////////////////
KEY FIRST STEPS TO TAKE TO SUCCESSFULLY LAUNCH THE CHANGE:	
1. ///.	
2. ///.	
3. ///.	

```
..........................................................................................
n. /////////////////////////////////////////////////////////////////////////////////////
n+1. /////////////////////////////////////////////////////////////////////////////////////
```

It is crucial to highlight the importance of the table proposed by Lauri Tabur for structuring the process of case resolution. This tool enables participants to comprehend each step and its sequence, thereby facilitating effective problem-solving. Organizational leaders can adopt this approach to alleviate employees' fears, particularly in crisis situations characterized by time constraints. By providing a structured framework, this approach empowers individuals to contribute their ideas and perspectives to issue resolution, thereby avoiding hasty or irrational decisions.

Furthermore, this approach is applicable across organizations of varying sizes, from small businesses to medium-sized enterprises and large corporations. Its versatility lies in its ability to promote collaboration and systematic problem-solving, irrespective of organizational scale or complexity.

Many basic concepts, tools and results of the theory of algebraic systems are suitable in order to form the theoretical basis for supporting decision-making process of change management. In the theory of algebraic systems, a system is called an ordered pair

$$A= \langle M; \Sigma \rangle \tag{1}$$

in which on the first place is the set of some selected and fixed element M. We will call the elements of the set M – the elements of the system under consideration, or in short – selements. In such a case, the set M itself is often called the basic set or the main set of the system, instead of which we will use the name selementry below.

in second place is strugementry Σ or the set of instruments necessary for structuring the set of selementry. In accordance with the above, the instruments necessary for structuring selementry, or hereinafter – strugements are: pre-selected and fixed properties of the selements and/or pre-selected and fixed relationships between selements.

We assume that each situation in an organization an algebraic system as ordered pair $\langle M; \Sigma \rangle$ where on the first place must be the selementry or the set (M) of the elements of the system and on the second – strugementry or the set of the strugements of the system.

Every situation – as a system – of the organization (fears, fears' mitigation, key first steps to take to successfully launch the change) is described by numerous statements. We use the Lorents' coefficient to assess the similarity of situations as systems. To calculate this

coefficient, we have to choose which components of one system we want to equalize with some components of another system (and which we do not). Here we see a significant difference between the Lorents coefficient and the Jaccard coefficient - the calculation of the Jaccard coefficient (see Jaccard 1901) is based on the same elements, but in the case of the Lorents coefficient the equalized elements are used [2]. Once the choice has been made, a numerical ratio must be found which expresses the proportion of things to be equalized to the sum of all the components of both systems.

We propose to compare the cases' statements of one set with similar groups' statements another set. It helps us to create the data set of fears' mitigation during the War. We propose include coefficient similarity (Sim (P, Q)) in strugementry.

In order to evaluate the descriptive similarity of the descriptions or sets of relevant statements – that is, the descriptive similarity of some things, situations, developments, etc., we will use the numerical value defined by Lorents below - the descriptive similarity coefficient:

$$\text{Sim}(P,Q) = E(\text{Com}(P,Q)):[E(P) - E(\text{Com}(P,Q)) + E(Q)] =$$
$$= E(\text{Com}(P,Q)):[E(\text{Spec}(P)) + E(\text{Com}(P,Q)) + E(\text{Spec}(Q))] \qquad (1)$$

According to this formula, it is first necessary to make descriptions of both sets, which must consist of relevant statements. At the next stage, it is necessary to clarify what statements from one and another description can be considered equivalent. Such a declaration of equivalence is here in after referred to as equalization, and the corresponding statements are equalized. There are now three sets of statements:

-   P is a set whose elements are statements from the first description;
-   Q is a set whose elements are statements from another description;
-   E is the number of elements;
-   Com(P, Q) is a set of elements that are ordered pairs, where the first position of the pair has the statements P, the second position has the statement Q, and these statements have been equalized by each other.
-   Spec(P) is a set so-called specific statements that appear in the first description but do not have equivalent ones in the second description;
-   Spec(Q) is a set of so-called specific statements that appear in the second description but do not have equivalent ones in the first description).

Based on this approach, we will analyse the obtained textual data in order create the basic for the decision-making process with precedent decisions.

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Strategic Imperatives of the national Economies' Competition

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Abstract

The purpose of this work is to assess the interdependencies between economic growth, competition, and innovation and to conceptualize the complex measures for stimulating innovative development.

Theoretical Framework

As economic phenomena, both competition and innovation determine and shape the business entities' *modus operandi*. Theoretically, in the long run, market competition could be and should be capable of maximizing the respective economic agents' benefits. Meanwhile, the aforementioned agents' anti-competitive intentions and unfair practices prompt respective institutional counteractions. In the most radical cases, competition forces authorities to impose anti-monopoly policies (aimed to ensure general fairness and optimal economic performance as well). Thus, the competition's ontological aspects form an essential object for investigation. Moreover, its initial idea derives from the architectonics of public production and innovation *par excellence*. Innovation is commonly considered as a trigger for both market competition and sustainable development. However, the exact model of strategic interconnection between competition and innovation depends on the national economy's institutional peculiarities and is determined historically.

Regarding the period from 2007 to 2022, we considered the sample of Central European countries and the Baltic states. The interdependencies between macroeconomic dynamics and a set of competition and innovation indicators have been assessed.

Methodology

We focused on a sample of national economies that made their transition from centralized planning to the market in the 1990s. The national economies of Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, Slovakia, Slovenia, and Ukraine were investigated.

According to the Wicksell / Cobb–Douglas productive function, labor (as a proxy to human capital) and physical capital are imperfect substitutes. That fact could be roughly described by *the system (1)*:

$$\begin{cases} Y = A * L^{\beta} * K^{\alpha}, \\ 0 < \alpha < 1, \\ 0 < \beta < 1, \\ \alpha + \beta = 1, \end{cases}$$

<div align="right">(1)</div>

where Y – annual total production; L – annual labor input; K – annual capital input; A – total factor productivity; α and β – the output elasticities of capital and labor, respectively.

Due to the classical explanation, both α and β values are the constants and has been determined by the modern technological paradigm. Meanwhile, in social and economic systems, synergy matters essentially. Pasichnyi & Nepytaliuk (2021) pointed out that not only positive, but also the other (negative and neutral) synergistic effect should be considered while preparing strategic public regulation measures. The above effect derives from the interconnections emerging between the basic public production elements. To determine total factor productivity, we applied a function of the above interconnection' arithmetic sum (*model 2*):

$$A = f\left(\sum_{i=1}^{n} EP_i\right),$$

<div align="right">(2)</div>

where EP_i – emergent potential of the i-th interconnection between the basic public production elements.

Regarding the scientific investigations addressing the problem, the system elements interconnection's emergent potential (*model 3*) derives from respective innovation and competition potentials:

$$EP_i = f\left(IP_i, CP_i\right),$$

<div align="right">(3)</div>

where IP_i and CP_i – innovation and competition potentials of the investigated macroeconomic system elements' interconnection, respectively.

In this study, we decomposed the system elements interconnection's emergent potential and refined the economic growth-friendly public policy mix.

Results

We compared the real GDP per capita growth rates in the sampled countries and the structure of public production (Figure 1).
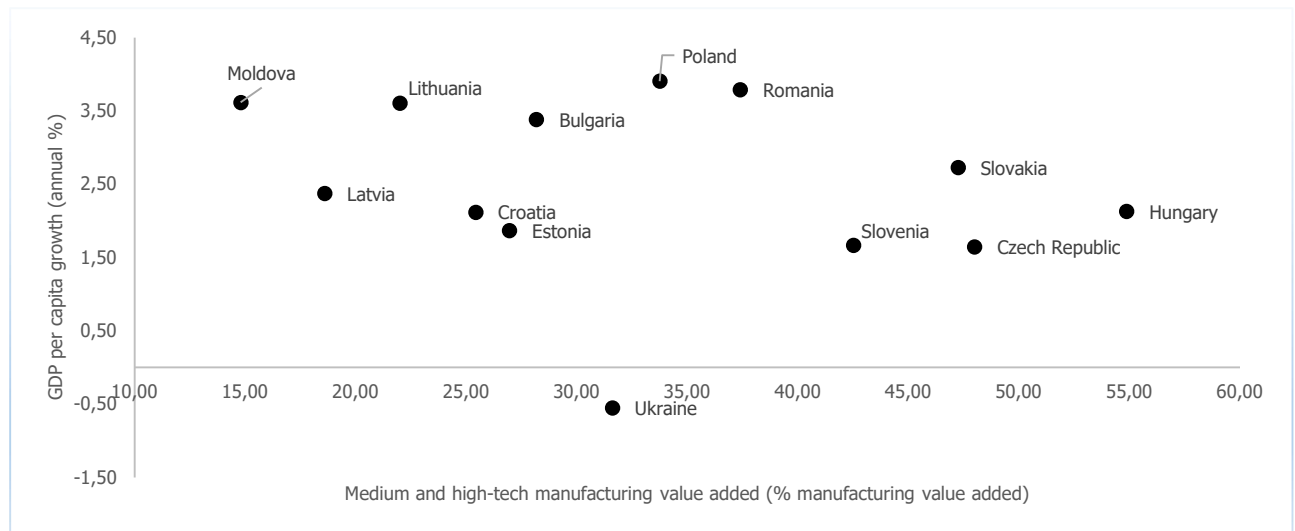
Figure 1. The average proportion of medium and high-tech industry value added in the total value added of manufacturing and the average economic growth rates in Central Europe and the Baltic states in 2007–2022. *(Source: the authors' own calculation based on the World Bank and the International Monetary Fund data)*

Regarding the real GDP per capita growth rates, the entire sample could be divided into three sub-samples. Firstly, the sub-sample of the countries with a low indicator ranged from –0.55% in Ukraine to 1.87% in Estonia (the group included the Czech Republic and Slovenia). Secondly, the sub-sample of the countries with a medium indicator ranged from 2.12% in Croatia to 2.73% in Slovakia (the group included Hungary and Latvia). Finally, the sub-sample of the countries with a high indicator ranged from 3.38% in Bulgaria to 3.91% in Poland (the group included Lithuania, Moldova, and Romania). The global financial instability and the COVID–19 pandemic affected the sample, provoking a decline that has been equaled to 7.63% and 3.67% of real GDP per capita in 2009 and 2020, respectively.

The case of Ukraine has been unique for the entire sample. In addition to the Great Recession and the COVID–19 global pandemic consequences, hybrid and eventually conventional war affected the Ukrainian economy in 2014 and 2022, respectively. Due to the Great Recession's impact, the aforementioned indicator's annual decline equaled to 14.76% of real GDP per capita. Meanwhile, due to the full-scale military invasion, the growth rates decreased by 17.13% of real GDP per capita. In the post-war period, theoretically, innovation and constant search for competitive advantages in co-operation with the other sampled economies could ameliorate the Ukrainian economy's performance and contribute to a substantial increase in public welfare.

Regarding the entire period, Poland was the only sampled country with constantly growing economy. An insufficient decline (equaled to 1.85% of real GDP per capita in 2020) appeared to be episodic and derived from the COVID–19 global pandemic. Moreover, during the Great

Recession, the Polish economy has been rising by 4.19% and 2.76% of real GDP per capita in 2008 and 2009, respectively. The observed phenomenon has been due to an effective policy mix (applied by the Government of Poland) and to innovation (provided by the business entities).

The stochastic interrelation between the above two indicators was rather ambiguous. The average proportion of medium and high-tech industry value added in the total value added of manufacturing varied significantly from 14.80% in Moldova to 54.87% in Hungary. Moreover, considering the entire time interval, the average economic growth rate in Moldova equaled to 3.62% and has been significantly higher than in Hungary (with the indicator equaled to 1.87%). Thus, the investigated proportion was quite important, yet not the ultimate criterion for ensuring high economic growth rates and sustainable development.

Discussion and conclusion

Despite the results obtained by García-Sánchez et al. (2018, 2021), regarding the sample, the relationship between innovation, competition and prosperity has been rather ambiguous than statistically robust. Even though innovation contributed to economic development and global competition, its overall effect should be investigated properly. The idea of Hermundsdottir & Aspelund (2021, 2022) that sustainability innovations might create win-win situations for a firm could be considered regarding the national economy as well. At the last case, a growth-friendly fiscal policy mix should be applied to promote sustainable growth.

In terms of human intellectual capital formation, it is important to apply a new recognition approach to non-formal professional and vocational education. The business community should initiate, form and develop innovation and technology clusters, taking both national economy's regional structure peculiarities and fiscal jurisdictions' profile into account. The other crucial task for the economies under study is associated with the investment and innovation ambassadors' concept implementation. Compiling the rules of fair competition, such economic agents could catalyze regional development processes and actively affect the labor market.

Businesses, institutions of higher education, and scientific centers should co-operate intensively to create a new growth-friendly economic paradigm. The aforementioned cooperation could include support of scientific and pedagogical personnel participation in international conferences and symposia, direct business financing of applied studies and co-financing of fundamental research. In addition, the practices of registration, promotion, protection, and support of intellectual property rights (e.g., patents, copyrights, trademarks, brands, etc.) should be enriched. Theoretically, the above policy mix could be able to ensure sustainable economic growth both in the medium term and in the strategic perspective.

Keywords: competition, economic growth, high-tech economy, innovation, investment, sustainable development, taxes, research and development expenditures.

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Digitalization and modern Technologies

The Meta-Analytics of Data Science: An intuitive Perspective

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Abstract

This paper is dedicated toward understanding the meta-analytics of data science. Data science—being now an independent domain—demands a greater expertise and skilful ability on the part of data analysts who perform analysis of data. Beyond analytic acumen and technical expertise, however, the involvement of noetic elements—what we may call the intuitive aspects, have become necessary for successful interpretation of the results of data analysis. This I call the meta-analytic perspective of data analysis. In this paper, I attempt to underline the foundational processes based on which meta-analytic and the epistemological perspectives could be grounded in relation to the science of data analysis. Knowing how to perform data analysis is as important as understanding the *principles* upon which the domain rests.

Keywords: Big data, ChatGPT, Data analysis, Data science, SMART criteria, Meta-analytics of data science, data epistemology, philosophy of data science.

Introduction

Data science has evolved more rapidly than most other scientific domains within the past few decades. It has found its usefulness and utility in almost every domain of inquiry and understanding, including psychology, sociology, marketing, business analysis, sales, scientific research, hospital and tourism industry, healthcare, among others. Moreover, this is the age of big data where corporates and organisations deal with large-scale data for seeking answers to rapidly evolving problems (Albright and Winston, 2020; Canali, 2016).

Data analytics, which is analysis of data, is a skilful activity in which information collected as data in a quantified manner which when measured, tells stories i.e., stories that numbers tell. Data science is not difficult to master, but it often becomes challenging to analysts when they deal with big data (Geiseb and Ndinelago, 2023). The analytic part of the analysis of data necessitate incredibly sharp intuition to interpret the findings of a data analysis. However, the entire aspect of data analytics is procedural in nature. It follows methodological steps that employ models to help dive deep inside the data to drawn insights. Understanding contexts

and intuition, therefore, provides the necessary guidance that is essential in data analysis, for it drives decision-making across sectors and industries.

It shall be noted that most ancient societies made decisions based on their observation and intuition. Very little means of collecting data, understanding its importance, and putting it to good use were around in ancient times. They used to deal with data in their own way. However, in the past, understanding of patterns have always been crucial for human survival, progress, and evolution. Today, data provides a richer context to research and analysis, as its importance in society has increased manifold owing to the insights that one could draw from the analysis of data. Data generates insights, and the unfolding of ideas from the analysis of data supports general assumptions just as examples do. Intuition, too, does play a significant part in data science and data analytics, fuelling our enthusiasm when it is supported by deep insights, wherein excitement is generated at the depth of analysis, which fuels further curiosity. Data is some sort of concrete evidence since it helps in the matters of investigation and inquiry. One must utilise the spirit of curiosity to dive deep into data using different means as tools and techniques (statistical models) to penetrate and identify patterns hidden within data—i.e., those that are not visible to an undiscerning, naked eye. Hence, we must also understand the sources offering data. However, the real problem in handling data is the sheer volume and variety of (big) data—a challenge that, according to the experts working on data science, (Venkatram & Geetha, 2017, Geiseb & Ndinelago, 2023, and Boyd & Crawford, 2012), needs to be overcome by industry analysts and practitioners, if it has to prove itself useful and worthy. Data is nothing but information obtained as "practical evidence" as it has always been applied to support or refute theories and assumption, propositions and hypothesis. That is to say, 'prove your point with evidence.'

The main objectives of this research, thus, revolve around these issues that we can categorise as the metaphysics of data analysis. While at the same time, it is also necessary to understand the role played by *intuition* in providing the meta-analytic perspectives of data science. It is beyond the capacity of this paper to provide a detailed perspective concerning a historical analysis of data practices in major sectors of the economy (Venkatram & Geetha, 2017), as this paper is not evolutionary in nature. However, by exploring a different dimension, it discusses the progression of data analytics today. The research being 'review' in nature, it concerns the fundamentals only: It discusses the unique challenges and benefits of data analytics that analysts need to deal while performing analysis of data. In such spirit of enquiry, the research integrates both scientific and philosophical perspectives of data analytics, always being eager to contribute to new knowledge, or add new perspectives to the already existing, by providing a novel dimension concerning its meta-analytics aspects. If we closely compare the realms of data science with a mountain peak, we may notice the similitude between them:

a peak gives some novel insight to the data, whereas a trough may constitute a challenge to be navigated.

The Progress of Data Analytics: A Literature Review

Data analytics has progressed with the advancement of technologies. Since data is king in this age of digital technology, most marketing, communications, media houses, and PR agencies use data as an effective marketing tool. Moreover, as the age of big data is already in place, there is a need for scalable Big data technologies that have evolved over time, leading to industry practitioners leveraging them to achieve success and fight competition (Venkatram & Geetha, 2017; Geiseb & Ndinelago, 2023). Indeed, the era of Big data has begun (Boyd & Crawford, 2012), as it has made data-driven research possible (Canali, 2016), but causal knowledge cannot be ignored as well, and it should become a part of the Big data science. Moreover, it needs to be seen how far it is able to help ease human communications, or provide better services, as critical questions concerning the applicability and usefulness of Big data still emerge (Boyd & Crawford, 2012). Given all this, it must be acknowledged that Data Science has now become a scientific domain in its own right. In social research, too, the methods of gathering or collecting data are crucial for doing a meaningful analysis.

> *Science refuses to respect illusions whereas facts refute them. Truth is established by facts, and facts influence to change people's opinions.*

What do you do with data? How do you want to use the data? Do you estimate parameters or predict and compute probability distributions? These are the questions that data analysts and data scientists constantly have to deal with (Albright and Winston, 2020). Data can be used to challenge findings, refute conclusions, test assumptions, or prove hypotheses. Data is a resource—an asset—that can be leveraged to build expectations around it, derive meaning from it, and obtain information from it. Any set of data contains "elements" that provide us with information.

Data is used to predict the outcome of an effect, say (x), by using one or more independent or predictor variables (y). During data analysis, the analyst attempts to determine the best predictors of an effect—say, 'x'. There may exist many predictors (y) of something that may or may not help determine, say, a behavior in (x). Data may contain patterns that may indicate a prevalence, trait, trend, or effect. Data can be used to answer a question, define an effect, or determine an underlying cause using variable(s) that indicate attributes in a data set. Statistical models are designed and employed that serve the purpose of data analysis. Without data, there's no statistical analysis ever possible. A model is used to determine a characteristic that best predicts something. It is the distinguishing feature (y)—a trait or an attribute is what determines the nature of a thing (x).

The goal of this paper is to discuss and understand the meta-analytics of data science. Meta-analytics refers to the analysis of something at a higher plane or order—an advanced level beyond the given. Data science begins with collecting data. Data is generally collected in a methodical manner if it is to be of any useful value. The collection of data comprises several steps that are important for the integrity and preciseness of the collected data. Once collected, the data undergoes categorisation and sorting. Its significance lies in its efficient storage. One can collect data by various means, e.g., performing a literature search, doing field work, from interviews, surveys, questionnaires, observing events closely, or from experiments. These are the primary data collection methods. Secondary data are obtained from databases, collected from past research results, or by someone else other than the primary user, from primary sources that are distributed, shared, or primary data hosted by third party sources (Vartanian, 2010). Deriving information from experts is also a source of data. Data can be obtained from questioning, as it involves gathering facts about a question. But before that, one must understand the characteristics of a good question. Along with it, one must identify the question that needs an answer.

Data Modelling and Methodology: How to Identify a Question?

The primary task that a data analyst is responsible for beyond handling and analysing data is "to identify a question". A formidable and robust question leads to an effective inquiry. All inquiries are conducted to obtain information. Here, the researcher's job is to collect data based on a question that would most likely provide her with answers (information) contained within the data. But before one asks questions, one must identify and select a topic. According to (Peng & Matsui, 2015), questions need to be asked to develop expectations. The development of expectations is linked to the formulation of hypotheses (Popper, 1999). Following this, one engages in the collection of information to see if it matches the prospects related to the expectations built upon the question. If not, it is advisable to refine and revise the question, or identify a better question on the same topic that suits the data. A precise formulation of the question leads to better analysis as it increases one's analytic acumen, which enables one to work with data confidently.
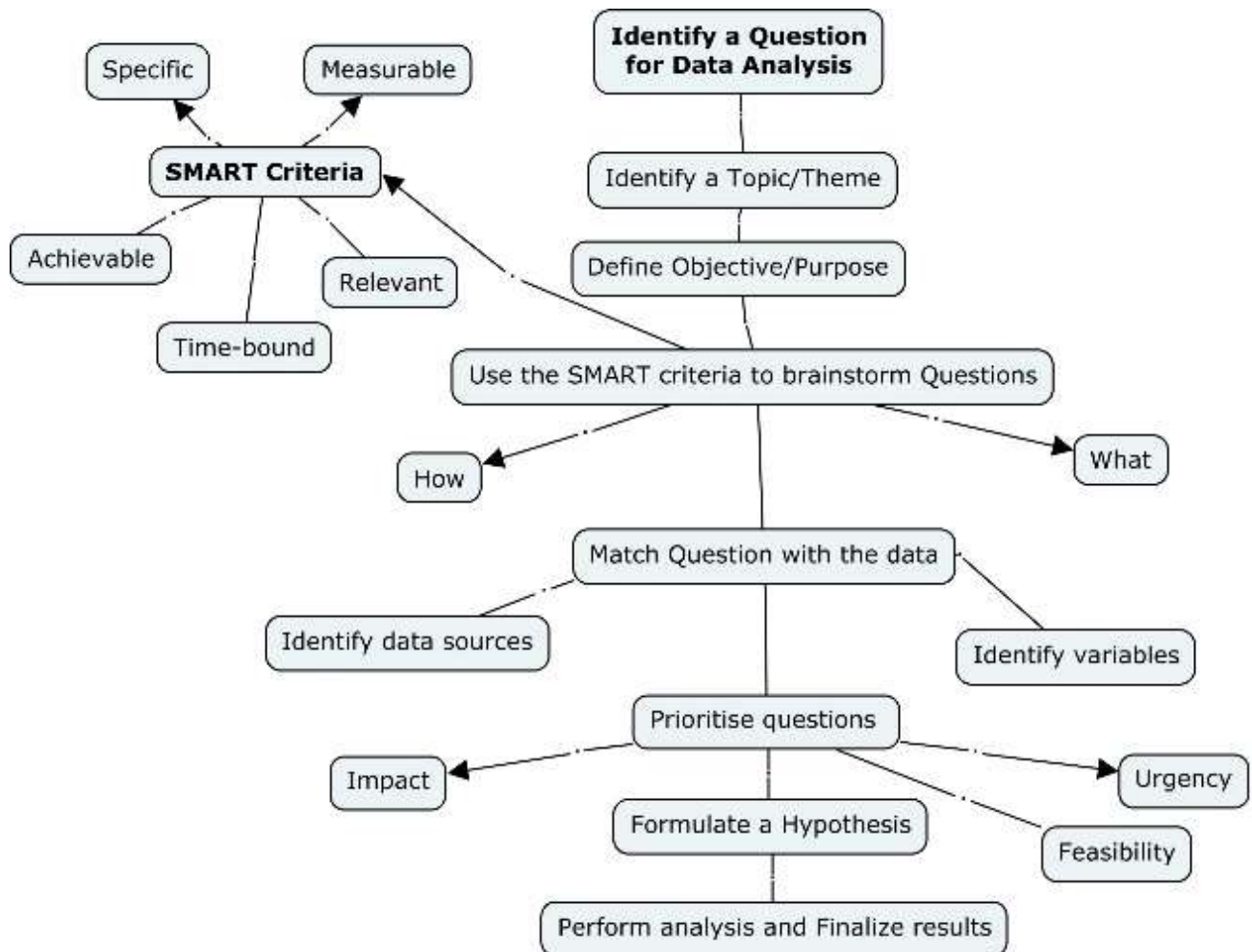
Fig. 1 HOW TO IDENTIFY A QUESTION?

Good questions lead to good data, for instance, a question that aims to inquire about a practical problem (see Fig. 1). It starts with collecting information about questions, events, and things. A question that seeks more information about a topic yields rich data. It's a question that reaches the depths and seeks to find what lies at the core—the bottom of things. Successful data analysis follows effective data collection. In this paper, the meta-analytics of these aspects are considered in detail, which sheds new light on the effectiveness of data collection methodologies and the role of efficient processes in data analysis. The meta-analytics of data science in a modern context must also involve the inclusive role of advanced computer technologies, machine intelligence, and AI generative language models (i.e., ChatGPT and others) that aid in searching and analysing the data and constitute effective machine tools that can be leveraged by analysts for conducting successful data analysis (Simske, 2019; Hassani & Silva, 2023). Besides, ChatGPT and other AI tools enhance the data science workflows that increase the productivity and accuracy of data analysts. These advanced generative intelligence tools not only help augment the field of data science, but they are better organiser

of data and information that helps improve the decision-making process (Hassani & Silva, 2023). In a simple sense, artificial intelligence-based tools improve the collection, analysis, and interpretation of data to extract meaning and derive insights from them, which addresses the demand for data-driven decisions and insights that lead to decisions with superior outcomes. However, it remains to be seen how ChatGPT and similar AI-based tools could really help data analysts make their tasks of analysing data faster and more accurate in the long run. The success of data analysis depends on the analytic acumen and skills of the analyst; machine tools just help them do better.

Characteristics of Successful Data Analysis

Successful data analysis begins with efficient data collection that attempts to answer the question(s) asked. The first thing that analysts should take care of concerning the data before analysing it is to understand the nature of the data. What data is needed? Does the data collected match the question? Two possibilities must be considered before one begins to analyse a set of data. Does the data match or override the prospects, and then, should one revise her expectations concerning the prospects? A set of data has several dimensions; i.e., the magnitude of the data collected, and the key indicators that specify and characterise the data thus obtained. Those who are expert data analysts have a definite eye for details, as they have developed expertise in data science and analysis. They can perceive errors in the data collected and quickly match the data to their expectations.

It must be understood that the data is not only used for supporting or refuting certain arguments or statements, but it is also employed to detect and solve problems. In the words of Karl Popper (1999),

"All science starts from problems."

That all science starts with problems is a notion that has its origins in Greek (Aristotelian) thinking. We solve problems using methods of trial and error, or finding specific solutions for them. Refinement in methods leads to the design of better and more effective solutions. Not to forget that the advancement in sciences and technologies is mostly dependent upon the refinement of techniques and tools of experimentation, observation, and interpretation (Lundberg, 1942). Data originates from experimentation and, more importantly, from observations. In fact, data makes us learn from observations (Galeano & Peña, 2019). John Dewey believed that results are chiefly correlative to the means and methods employed to achieve them (Dewey, 1904). It is the principles that define the methods to help determine the efficiency of a research endeavor. Not all research generates data, however. The theoretical ones, in particular, do not generate data. In empirical research, the results generate "data,"

which is meant to be interpreted and consumed. The data thus generated becomes a primary (original) source of information that can be stored for future consumption. Hence, the data becomes a commodity.

Successful data analysis depends on the methods employed in figuring out what it says, and how the interpretive results could be employed in trying out solutions to the problems. New problems require innovative solutions, and the solutions arise from our attempts to solve particular problems. It is here that data is required to understand the framing of a decision or solution aimed at solving problems.

"In simple words, data is central to a problem and its solution; it comes 'between' a problem and the solution." (Popper, 1999).

Now, it is true that something very specific can be verified with data, as data are facts that either help prove or disprove a prior theory or hypothesis. For example, marketing managers use data to assess the size and potentialities of a market for a product that is to be launched. For them, and for the business executives, data science for business have important implications (Medeiros, Hoppen and Maçada, 2020). They ask questions: How big is the market? Who are the prime competitors and market leaders in the segment? Answers can come in both numbers and characters, requiring both qualitative and quantitative analyses. The practical aspects could be explained with qualitative data analysis (Charmaz, 2006), and this could be grounded on theory based on the facts obtained from such analyses of data.

Nevertheless, guided by these questions, they gather data and feed it into the system for analysis. When required, they meticulously "fix" the data according to their expectations. The next thing they do is gather feedback from data analysts about their own perspectives, since they are the ones who do the analyses, deal with data, and are aware of the "methods of analysis" that best suit the data. With this information, marketers are able to predict the prospective size of a market for products in the future. Analysis also brings new questions to the forefront, and reveals the strengths and weaknesses of the sample size and quality of the data being analysed. This is what characterises the primary steps in successful data analysis. The secondary steps in data analysis involve the application of complex and intricate models to the data, in order to go more into detail. The choice of models, and their proper design involve expertise and acumen. The analyst must have prior knowledge of the models and methods of analysing data to chart out a clear conception of the problem at hand. Using common sense in applying models to a specific set of data tells a lot about an analyst's critical aptitude for a problem situation.

Building (Statistical) Models that Fit the Data

In data analysis, each variable is accorded a "space" whose importance is determined in order to reflect the attention it deserves. The space that each of the elements in a data set occupies constitutes the arrays, arranged in rows and columns. No two elements of a variable occupy the same space, and no space lodges more than a single unit of datum (singular of data). As in science, no two causes are exactly identical, or have identical effects, so it is in data science, too. Each datum is accorded its own singular space. A collection of arrays of data constitutes a set of data. Following analysis, the data will reveal what it is, what it means, and what it represents. To conduct an investigation on the collected data, we need models. These are statistical models so designed that they are based on pre-defined mathematical formulae. Robust models work well and fit the data. Some errors in data collection may remain, i.e., missing data (Newgard &Lewis, 2019), where missing elements might constrain the power of the model, but in general, given a small sample size, one can use statistical models, both descriptive and exploratory, to analyse and examine a given set of data.

For example, based upon a certain degree of correlation found between two or more predictor variables, one can conclude by deduction whether any two objects co-move or fall apart, are related or unrelated, similar or distinct, etc. Based on the results thus obtained from analyses, one can construct a theory to generalise an event, and so on. As a matter of fact, results from data analysis provide us with the necessary direction to think and take actions, to link causality to an effect, to establish connections, identify trends, etc. Thus, it would be appropriate to state that data guides our social, business, political, and economic/financial decisions. Guided by the outcome where results are obtained after rigorous analysis of data, we make the choices necessary to create a new path, or to adopt a given course of action that takes us to the future offering new prospects and opportunities. Such an endeavor generates new knowledge, which could be effectively utilised to make future decisions. Consider the following scenarios where data analysis often provides a direction for one's thought, action, decision, or research:

This is particularly helpful in situations concerning clinical trials and pharmaceutical research on new products (drugs). Data analyses revealing positive results help the pharmaceutical companies *promote* with confidence their newly designed drugs to effectively treat specific diseases in a particular group of patients.

A company wishing to launch a new product first undertakes market analysis based on collected data to find out whether there is a potential market for it. The results so obtained will be further analysed by the business analytics team to generate reports concerning such prospects, based on which managers would decide on strategic actions concerning new product launches, product modifications, pricing, product recalls, discontinuations, etc. (Albright & Winston, 2020).

Therefore, data in the service of business and human welfare can be of great help to organizations that rely on the results and outcome of data analysis to make their decisions grounded on facts and robust reasons. As a helpful reminder, it would be wise to keep in mind that each product or service is tied to its organisation's goals and objectives, expectations, prospects, perceptions, and limitations. Data fights limitations, revises expectations, and highlights prospects, for it provides the requisite truths (facts) based on which business decisions could be made.

Now, just as knowledge plays a role on the limits of expertise, so does the data, for one can obtain the data from the past or present, but not from the future. One uses the data just to predict the future with a high degree of probability and uncertainty. Statistical models here play the most significant part in conducting the analyses on the data. To draw inferences from statistical outputs interpreted as results, visualised and rendered comprehensible to the average eye, the models themselves must be powerful and robust. The real magic lies in conducting the analyses with the right tools of statistics, i.e., the models.

Bringing Metaphysical Thinking into Data Science

One of the focal aims of this short, narrative research commentary is to bring metaphysical as well as philosophical thinking into data science. Not that it has been attempted before, one can refer to the work done by Desai et al., (2022), who have explored the epistemological foundations of data science. What it requires is a strong love for the subject and a belief in the discipline of data science. One needs to have a deep intellectual interest in all things connected to data science. A good data analyst should be able to detect and identify patterns in data and correlate them with the world around her. This will prove the deftness of a skilled data analyst. And, beyond that, to introduce metaphysical thinking into it, one must have trust in real-time logic; so what will it require? It will require deep thinking and deliberation. And to give it a scientific foundation to boost interest among the new entrants attracted to the field of data science, they will need to do more project work related to this domain. Also, doing more research as a basis for new knowledge development in data science will go a long way towards giving it a solid metaphysical foundation. But what kind of metaphysical thinking should be infused into data science?

First, one must set a high standard of thinking related to data science. This one can be easily deliberated upon, in order to implement it in practice. Attempts must be made to provide a robust scientific foundation for data science, and only then could one think about giving it a metaphysical underpinning. The starting point of data science is not analysis, but to collect data concerning a given problem, and to get a better understanding of the problem itself. Then one can think about what to do with and how to handle the data. The logic of data science is simple: identify the problem statement, understand it with clarity, get the data, organize it,

design a model, feed it with the data, and run the analyses to perform tests on it. Finally, all these steps lead to the interpretation of results from data analyses. The most usual response to such an approach to Big data and data science is that one should have a critical attitude towards solving a problem using data (Venkatram and Geetha, 2017). Some argue that it is a better option than using only common sense in critical problem situation (Popper, 1999).

But what about infusing metaphysical thinking into data science? What about being so philosophical and conceptual about data science (Desai *et al*, 2022; Fattahi, 2022)? These relate to higher-order analyses of the data using more sophisticated and complex models to yield more abstract results. Because today's problems are complex, so must be the methods and processes that lead to solutions. But sometimes, this is not the case. Although most attempts do not lead to concrete solutions, those that do evolve over time that lead us to learn and know about successful solutions to specific problems. But how do you know what's important in data science research and analysis? How would one know what's important to learn, and discard what's useless? This will result from a search for relevant knowledge on the deeper aspects of the subject, and it is where metaphysical foundations are called into action. As circumstances change, such changes produce new environments, which create "new data" as reference points. We can say in a similar vein that as problems evolve, so do their solutions, too.

Confidence on Data

Should all data be treated with suspicion, particularly those generated by artificial algorithm - based predictions (Berman, 2019)? This is still debatable, but most unlikely would be so. Data originating from credible institutional research activities and those hosted by authentic, trustworthy organizations could be relied upon to be valid. However, caution must be observed while accepting anything at face value. What is thought by an analyst concerning the data may not be readily perceived by others, unless proved otherwise by explanatory means that explain things and events using facts and truths, trends and possibilities, etc. Data can be used as a resource to garner power, as it becomes essential to influence, produce, and impact others. As such, validation of the authenticity of the sources from which the data is obtained remains a crucial aspect before conducting any research or analysis involving the data.

Most organizations and industries use data as a means to strengthen their businesses, fortify their decision-making abilities, streamline their operations, and bring efficiency in their performances. Information obtained from data analysis is highly valued to push corporate business agendas. Findings from marketing data analytics greatly aid managers in making marketing decisions, based upon clear understanding of customer, choices, behaviors and their consumption patterns. Findings from data analysis also empower production channels,

as it help strengthen the assembly lines where efficiency and precision are brought together to streamline operations.
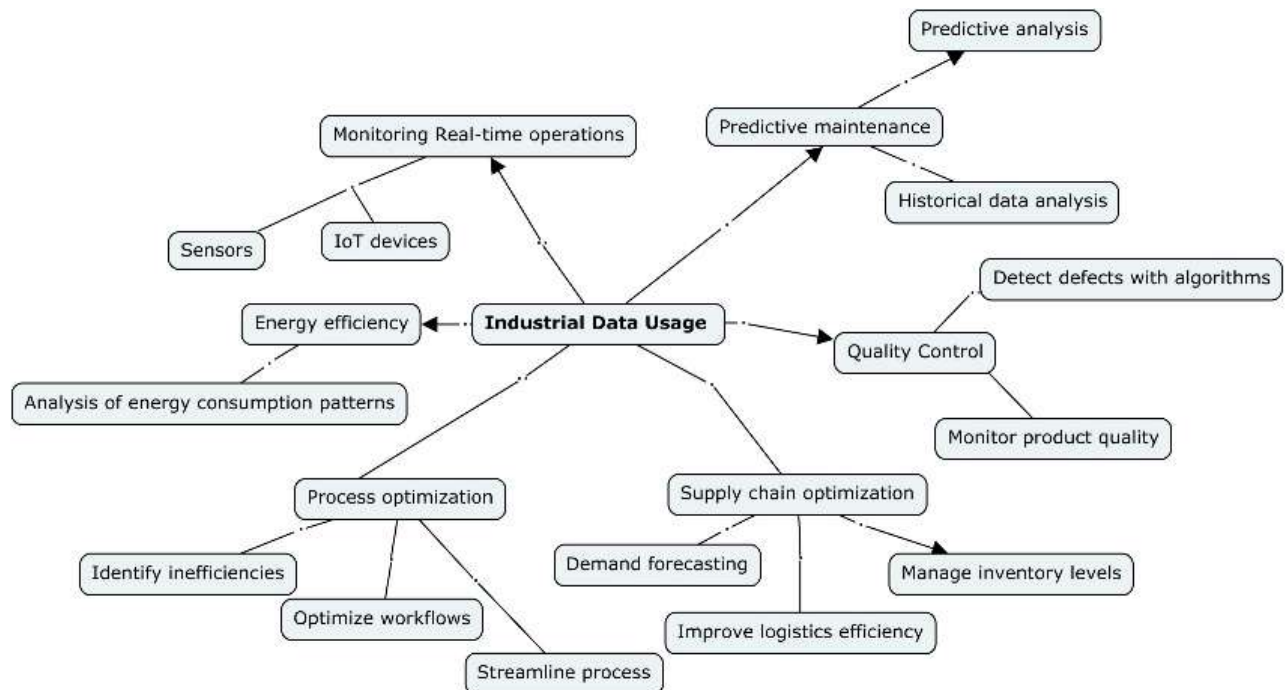
Fig. 2 Data Usage in Manufacturing and Production

Data improves productivity and increases productive efficiency of businesses (see Fig. 2). Businesses are able to make "informed decisions" based on data. The results of effective data analysis are employed in assessing quality control issues in manufacturing and production, and in dealing with issues related to the detection of errors on the manufacturing, production, and operational frontiers (Shivajee, Singh & Rastogi, 2019). When businesses face problems, they rely upon data, which informs them with much needed strategic insights. Solving practical problems using data analysis have become the norm in almost every sector and industry in the modern economy.

One must acknowledge the usefulness and importance of data in modern, contemporary society. We use data to detect hidden patterns and trends that may help solve practical problems. In the financial sector, data analytics is heavily relied upon for making trading decisions, buying, holding, and selling assets in the securities markets, and identifying trends for making investment decisions. Forecasting is one of the most important applications where past historical data is used to predict future trends in the financial markets. Therefore, in every aspect of economic and social decision-making, the role played by data and data analytics is fundamental.

Making decisions based upon the results from data analysis would seem far better than making decisions based on intuitions alone, although, sometimes, intuitions lead the way in solving problems, but not always does it so. And when intuition is guided by information and facts, our

confidence in our decisions increases manifold (Liebowitz, Paliszkiewicz & Gołuchowski, 2017; Svenson, Pietrzak, & Launer, (2023). We must not forget that facts and information have the power to influence opinions, thoughts, and sentiments. It is for this reason that data speaks with more confidence than expectations do. Expectations and intuitions can often go wrong, although they are based on the prior knowledge and expertise of the intuitionist. However, conclusions that are based on data, facts, and information are better accepted to be true than those based on instincts and intuitions alone.

Fundamental Principles of the Meta-analytics of Data Analysis

Metadata is the data about data—data that describes data, for example, a library catalogue that describes publications held in a library. Meta-analytics of data, however, is an analogous idea, yet it is conceptually dissimilar—as it describes the processes of data analytics at a higher level. It transcends the analytics of data by discussing the fundamental principles that govern analysis, and the design of novel tools of analytics for examining the data at a higher level, incorporating other cross-disciplines, AI tools, data linguistics, and network analysis. Therefore, it goes beyond the nominalist and discreet approaches to statistical analysis of data, into the theoretical domain, which engages with the ideation and design of more advanced, higher level methods of analysing data. Its aim is to bring a high level of efficiency to data analysis. It is a path towards the principality of the fundamental norms that bind data with analytic processes. As a clue leads one to the evidence to solve a problem, so do the fundamental principles that lead data scientists to the forefront of discovery—the discovery of what lies beyond the core and the periphery of the data (See Heidegger, 1996). If we pay attention to the cues and clues, we shall be doing better to see within the data, but of course, using specialised tools for analysis and visualisation. This is to say that our understanding of the content of data depends largely on how we understand and pay attention to the cues we're following. The materials for data analysis are—in essence, the predesigned tools and models, and the methods that determine the principles of reasoning in data analytics.

> *As a business or marketing analyst, you must know how to analyse data efficiently, if you know nothing else.*

Methods help us delve deeper into the data. Refinement in methods and the design of more efficient models increase the power of analyses. The knowledge of how things show up following analysis will lead us to the information that can be obtained from data. Conversely, it is also important to explore what knowledge can be obtained from data, and how the data can inform us. Besides, it is also essential to understand what data can be acquired from knowledge. The usual principle of flow of information may be represented as follows:

Data, Information, and Knowledge

However, it is necessary to pay attention to what can be known (or not known) from analysing a set of data. We search for a reason, and if the cause is unascertainable from the effects that actions produce, then we will need to get back to the basics and start thinking again. We will need to get to the bottom of what is being encountered as a set of "data." And we will need to get to the bottom of data analysis and try every means using all possible methods and models that fit the data to discover what it means to us.

Data helps us turn to facts.

Facts inform us about the truth and give us the confidence to form polished opinions. If we closely reflect on the principles of data analysis, we will notice that good things are found at the core. To get to the core, we must know the how—the principle of knowhow. Because, within the deepest core of the data, are to be found the hidden patterns that can only be uncovered using specific tools and techniques of analysis. That is to say, the answer to a specific problem is concealed in the principles of analysis. We must understand what the principle says. This makes sense, for what is without reason is lacking in understanding. Data must make sense in order to be understood, and it is the principles of analysis that make it more sensible to the eye of an analyst.

The Knowledge of Data Analytics

When we analyse data, we embody useful effort in it. Effort manifests itself in the value of analysis performed. The ability to see into the data is dependent on the expertise of the analyst in handling and examining the content of the data, i.e., factors that determine the "analytic power" and "acumen" of the data scientist. The ability and intuition vary among different individuals, and so does the expertise that varies, too, among the data scientists. But since they are trained and equipped with industry-standard, state-of-the-art programmes, they gain the required expertise to handle Big data. Therefore, today, one may observe that the practice of data science is homogenised, which is reliant on the acquired abilities and skillsets of the analyst (Hughes & Ball, 2020). Data analysts are trained with a special aim—alike other professions, which demand advanced skills and aptitude. This creates the value of training programs that empower people with the necessary dynamic skillsets to render them capable of handling big data. Now, it corresponds to the expenditure of 'energy' with a special aim. The value is connected to one's efficiency and productive power, hence, the more efficient and capable the data analysts are, the better they become accustomed to handling and performing data analysis by getting into the core content of the data in question. However, data science

is not unfailing; it has limitations. It is not always directly feasible to observe from the data or predict the probability that a particular event will succeed or fail (Foster, Rzhetsky and Evans, 2015).

In the manufacturing sector, for example, producers are most concerned with different kinds of data and information: i.e., production time and cost analytics, process management data analytics, quality control and assessment data analytics, etc. The meticulous collection of such data and their rigorous analyses produce insights that have a direct effect on workforce productivity and productive efficiencies (Crandall, 1991; Saxena, 2014; Areiqat and Al-Qaruty, 2023). Now, in order to make data an effective source of knowledge, and an instrument of productivity for managers and decision makers, it is necessary to have a dedicated data analytics team that conducts rigorous analysis using robust models. For this to happen, data analysts must acquire a higher level of proficiency and expertise in the science of data analytics.

Conclusion:

Data has become a capital resource in this era of digital capitalism (Sadowski, 2019). There is a tangible value attached to data analysis, as it is one of the most sought-after careers today and promises great prospects for the data scientists entering this domain. The value of something becomes tangible when it turns into a product. However, its utility may not be immediately apparent, though a product is developed with a definite purpose in mind. Data—in its strictest sense—is a product that has marketable value, and the skilful art and science of data analysis is a value-embedded profession today. Mass production and consumption of goods create a huge amount of data at the point of sale—the marketplace. This data relates to the consumption patterns of consumers, individual choices and preferences, and their purchasing patterns, all of which become important "data" for producers and marketers. Consumers—now, too, are becoming conscious of the data as they are gradually turning into "informed customers." However, current research fails to indicate that they are more concerned with market data—let alone data in the first place, when they make purchasing decisions. Nevertheless, when they become sellers, they develop a perception of the markets, and to them the "data" becomes an important guide to marketing and selling products (Ichihashi & Smolin, 2022)—online or offline.

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Investigation of New Generation Restaurants in Gastronomy Digitalization Process

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Extended Abstract

As a result of technological developments in the world, new developments have occurred in the preferences of individuals and in the service sector offered to individuals. It is seen that the field of gastronomy is also included in this process and innovations are made for both consumers and producers. In recent years, restaurants that have adopted sustainable and environmentalist approaches around the world have started to draw attention to the measures taken within the scope of sustainable and environmentalist practices with the rapid growth of environmental problems worldwide with the development of technology. In this context, it is thought that the environmentally friendly restaurant concept of new generation restaurants will become more widespread in the coming years. For this reason, it is foreseen that the guests who receive service from environmentally friendly new generation restaurants will provide theoretical and practical benefits together with examinations in the category of consumers' satisfaction and complaints. It is seen that there are a limited number of studies revealing the importance and benefits of technology and environmental practices in new generation restaurants. In this context, it is seen in the literature that the guests develop consumption habits by thinking that the applications within the scope of green practices contribute to the environment. Thus, it is possible to mention that the related environmental practices provide an emotional benefit for consumers (Park, 2020). In addition to green practices in new generation restaurants, technology 4.0 applications can positively affect the sustainability of natural environments (Dutta, 2008), reduce the costs and workload of food and beverage businesses. It can also improve the corporate image of food and beverage businesses. Schubert (2010) states in his study that new generation restaurants have a great impact on the decision process of consumers as a potential niche market. For this reason, gastronomy 4.0 practices of new generation restaurants are effective in strengthening brand and customer loyalty and gaining new guests (Perramon, 2014). Differentiation is achieved through the innovative development of new generation restaurants (Tan, 2019). The adoption of gastronomy 4.0 practices in restaurants is seen as an incentive to improve the market success of restaurants and the performance of food and beverage businesses (Perramon, 2014). The

technology initiative in next-generation restaurants can provide a positive financial benefit as well as financial incentives that can be collected from the guests of the restaurants (Schubert, 2010). It is seen that there are few studies on new generation restaurants as a research field, but there have been developments in related studies in recent years (Arun, 2021). The establishment of food and beverage businesses requires less capital and knowledge than other tourism businesses (accommodation businesses, travel agencies, etc.), which creates an intense competitive environment in the sector (Akyürek & Kızılcık, 2018). In this context, it is seen that some technological applications are being adopted to increase the competitiveness of restaurants. It is possible to mention that these practices can adopt some environmental practices that increase competitiveness. In this way, it is possible to mention that costs can be reduced and some competitive advantages can be achieved in the long term by providing financial and operational contributions (Ma & Ghiselli, 2016). When we look at the main characteristics that distinguish new generation restaurants from other restaurants; it makes a difference in terms of their progress towards reducing unsustainable products, giving importance to the reuse of products, using recyclable materials, saving energy and increasing efficiency (Gilg, 2005). For this reason, new generation restaurants should be restaurants that focus on the three R's (reduce-reuse-recycle, reduce-reuse-recycle) and the two E's (energy and efficiency) (Lita, 2014).

It is seen that the internet of things, three-dimensional foods, cloud computing technologies, big data, augmented reality, robot systems, imaging systems, automation, cyber power security measures and robot service technologies are included in Gastronomy 4.0, which is presented by the gastronomy 4.0 revolution in the technology used by businesses in the food sector to improve their products and processes and to improve the supply process in order to reach the highest level of products and services offered to consumers. It is possible to mention that these technologies are frequently used today. It is very important to determine the extent to which these extremely important technologies are used by new generation restaurants. The main purpose of this study is to examine the possible impact of the digitalization process in gastronomy on new generation restaurants. In addition, it is aimed to reveal the opinions of faculty members and students studying in the field of Gastronomy and Culinary Arts and restaurant business employees on this issue. In this direction, interview technique, one of the qualitative research methods, was utilized in the research. The data were obtained from new generation restaurants operating in Ankara and Istanbul, faculty members and students of gastronomy and culinary arts department. It is seen that online comments on new generation and green restaurants have been focused on before (Dalgıç, Taştan, & Kızılcık, 2017; Erdem & Yay, 2017; Şengül, 2018; Yaşar, 2019; Şahin Perçin & Yiğit, 2020). In this context, in this research, one-on-one interviews were conducted with experts in the field and guests. In this research, two large metropolitan cities were selected and evaluations were tried to be made

regarding the use of gastronomy 4.0 applications by new generation restaurants. In line with the data obtained, it has been observed that augmented reality, cloud computing technologies and robot service technologies have recently started to be used by restaurants, QR code menus are frequently used, and contactless payment NFC method is frequently preferred by consumers because it provides ease of payment. In addition, it is seen that new generation technological applications have a positive effect on consumers' choice of restaurants.

In line with the research results, a number of recommendations for local and centralized methods for new generation restaurant entrepreneurs and operators are presented. These recommendations are categorized as follows. New generation restaurant operators and entrepreneurs should employ qualified personnel in sustainability and new generation technologies in their management processes. Businesses that offer delicious food and businesses that attach importance to rich gastronomic experience should be more intertwined with technology. In order to reduce the complaints and dissatisfaction of guests in new generation restaurants, first of all, situations such as not offering high pricing, not having qualified chefs and service staff in the restaurant and not visiting tables should be prevented. It should be emphasized that any problems that may occur during the reservation and service process should be solved at that time by working in integration with new generation mobile applications. In addition, guest comments shared on online platforms should be responded to immediately.

Keywords: Digitalization in Gastronomy, New Generation Restaurants, Gastronomy 4.0

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Internet and Facebook Addictions among Filipino Students in Higher Education

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Extended Abstract

The Internet, particularly through platforms like Facebook, offers significant advantages in communication, information access, and leisure. Launched in 2004, Facebook has grown into a dominant social networking site with over a billion users, and its influence continues to expand, especially in developing countries. In the Philippines, social networking is deeply integrated into the culture, playing roles in education, campaigns, and even criminal investigations.

However, there are challenges associated with social media use. Research highlights issues such as data privacy, echo chambers, and misinformation, which affect the quality of discourse and critical thinking. Additionally, Internet addiction has become a growing concern, with excessive use leading to psychological and social issues. In academic contexts, Facebook addiction is linked to poor academic performance, anxiety, and low self-esteem. On the other hand, the Internet can provide positive social support that improves mental health, though its overuse is associated with procrastination and declining grades.

This study explores the prevalence of internet and Facebook addictions among students in higher education institutions in the Philippines. Specifically, it presents the levels of addiction of Internet and Facebook addiction. It also shows the significant relationship between internet addiction and sex, type of institution, level of familiarity, operations and tools, and social technologic ladder. On the same manner, the paper also explores the significant relationship between facebook addiction and sex, type of institution, level of familiarity, operations and tools, and social technologic ladder.

The study utilized datasets from an open online course titled "Fighting Information Disorder on Social Media" (Marcial, 2023), which is free and available to a wide range of learners, including teachers, researchers, and students. The course, designed in an asynchronous format with a duration of 54 hours, aimed to equip participants with the skills to combat misinformation, disinformation, and mal-information on social media. Using micro-learning, gamification, and self-paced activities via the ourSOUL Learning Management System, the course covers six modules on topics like fact-checking, the role of echo chambers, and the ethical use of digital tools. For this study, 109 respondents were selected from an initial 136 participants to analyze data on Internet and Facebook addiction. The Internet Addiction Test (Young & Nabuco de Abreu, 2010) was used to measure internet addiction, consisting of 20 statements rated on a

5-point Likert scale. Similarly, Facebook addiction was measured using a 5-point Likert scale across six statements. Both tools assessed participants' usage patterns and the level of addiction to these platforms.

The results of the Internet Addiction survey indicate that respondents generally experienced internet addiction at a low level, with an overall mean score of 2.64, categorized as "rarely." Some of the more frequent behaviors included staying online longer than intended, with a mean score of 3.48, and often delaying other tasks with the intention of staying online for "just a few more minutes" (mean: 3.13). However, internet use rarely interfered with significant aspects of life, such as household chores (mean: 2.48), school performance (mean: 1.88), and job productivity (mean: 2.13). Occasionally, respondents feared that life without the internet would feel boring or empty (mean: 3.03) and anticipated their next opportunity to go online (mean: 2.85). Defensiveness about online behavior and negative emotions when offline were infrequent, with scores of 2.39 and 2.40, respectively. Overall, the results suggest that while some respondents exhibit occasional signs of problematic internet use, the majority experience low levels of addiction-related behaviors.

The results of the Facebook Addiction survey reveal that participants exhibited occasional signs of addiction, with an overall mean score of 2.93, categorized as "sometimes." Respondents frequently thought about Facebook or planned its use (mean: 3.17) and felt an increasing urge to use the platform (mean: 3.16). Additionally, Facebook was sometimes used as a coping mechanism to forget personal problems (mean: 3.16), and some respondents had unsuccessfully attempted to reduce their usage (mean: 2.90). Although participants occasionally felt that Facebook negatively impacted their studies (mean: 2.67), they rarely became restless or troubled when restricted from using the platform (mean: 2.54). These findings suggest that while Facebook use was prevalent among respondents, the majority exhibited moderate levels of addiction-related behaviors, with some signs of problematic usage.

The analysis of the relationship between Internet addiction and various factors reveals mixed results. No significant relationship was found between Internet addiction and sex (χ^2 = 1.95, p = 0.74) or type of institution (χ^2 = 1.87, p = 0.76). Similarly, there was no significant correlation between Internet addiction and the social technologic ladder (χ^2 = 22.43, p = 0.55). However, a significant relationship was identified between Internet addiction and the level of familiarity with technology, operations, and tools (χ^2 = 30.90, p = 0.00). This suggests that individuals with higher familiarity with technology are more likely to exhibit signs of Internet addiction.

The analysis of the relationship between Facebook addiction and various factors also shows mixed results. No significant relationship was found between Facebook addiction and sex (χ^2 = 3.89, p = 0.42), type of institution (χ^2 = 1.01, p = 0.91), or familiarity with technology, operations, and tools (χ^2 = 13.62, p = 0.09). However, there was a significant relationship

between Facebook addiction and the social technologic ladder (χ^2 = 55.23, p = 0.00). This suggests that an individual's position on the social technologic ladder is significantly associated with their level of Facebook addiction.

In conclusion, the study suggests that increased familiarity with technology and higher engagement in social technologies may elevate the risk of addiction, while demographic factors like sex and institution type have little influence. These findings highlight the need for targeted interventions to address the habits of individuals who are more deeply embedded in the digital landscape to reduce the risk of addiction.

Keywords: eLearning, responsible use of technology, technology addiction

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Confirmation Bias and Trust in Social media among Filipino Students in Higher Education Institutions

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Extended Abstract

In today's higher education landscape, social media plays a key role in how Filipino students access information, often serving as their primary news source (Calosa et al., 2023). This makes it vital to explore how confirmation bias and trust influence their consumption of information. Confirmation bias, where individuals favor information that aligns with their beliefs (Nickerson, 1998), is especially powerful on social media, impacting decision-making and critical thinking (Prakash et al., 2023). Trust in the reliability of information also shapes how students engage with content (Majerczak & Strzelecki, 2022), affecting the quality of their academic discussions. Understanding the interaction between confirmation bias and trust is essential for fostering a more discerning academic community. Investigating these factors among Filipino students is crucial as they influence academic performance, critical thinking, and decision-making skills.   This paper investigated the prevalence of confirmation bias and the level of trust in social media among Filipino students in higher education. It also presents the significant relationships between confirmation bias and trust on social media and profiles. This study, conducted between June and November 2023, involved 143 participants, including teachers, college students, and librarians. Respondents completed activity surveys from module 1 of a six-module open online course and a registration survey. Confirmation bias and trust in social media were evaluated using an adapted questionnaire with a 3-point Likert scale, where 1 indicated "disagree," 2 "slightly agree," and 3 "highly agree."

The demographic profile reveals a significant gender imbalance, with 81.82% female and 18.18% male respondents. Most participants (91.61%) are from public institutions, reflecting the perspectives of public-school students. In terms of concept familiarity, most respondents rated themselves as "Good" (34.97%) or "Fair" (28.67%), with smaller numbers indicating "Very Good" (19.58%) or "Poor" (9.79%), and only 6.99% achieving an "Excellent" rating. For social media engagement, the largest groups were "Joiners" and "Spectators" (30.07% each), indicating passive use, while smaller numbers were "Conversationalists" (14.69%) and "Creators" (9.79%). The results show that respondents tend to "slightly agree" (mean = 1.90) with sharing, liking, and believing posts that align with their views. They are more likely to engage with posts from friends using the "react" button (mean = 2.36, "highly agree"), though sharing (mean = 2.13) and liking (mean = 2.15) fall into the "slightly agree" category.

Engagement with posts from unknown individuals or organizations is lower, with mean scores ranging from 1.80 to 1.92, all rated as "slightly agree."

Trust in social media content shows relatively low scores. Respondents are more inclined to believe posts from friends (mean = 1.72) or respected figures (mean = 2.02) but show less trust in posts from political parties (mean = 1.59) or people they do not know (mean = 1.48), all rated as "slightly agree." This indicates a general tendency to trust familiar sources more than unknown or political sources, though even trust in familiar sources remains relatively cautious.

The chi-square analysis explores the relationship between confirmation bias and trust levels on social media and various socio-demographic and technological factors. The findings indicate no statistically significant relationships across all variables. Specifically, gender does not significantly influence confirmation bias or trust levels, as reflected by a chi-square value of 0.255 and a p-value of 0.880. Similarly, the type of institution (public vs. private) shows no significant effect, with a chi-square value of 2.679 and a p-value of 0.102. Familiarity with technology, operations, and tools also has no significant impact, as indicated by a chi-square value of 3.913 and a p-value of 0.865. Finally, different levels of social media engagement, represented by the social technographic ladder, show no significant relationship with confirmation bias or trust (chi-square value of 10.016, p-value of 0.615). The results suggest that no socio-demographic or technological factors examined significantly affect the respondents' confirmation bias and trust levels on social media.

The multiple regression analysis explores the relationship between confirmation bias, trust levels, and the respondents' profiles. The results show that most of the variables do not have a significant impact on confirmation bias and trust. Specifically, sex has a negative coefficient (-0.082) but is not statistically significant (p-value = 0.38), indicating that gender does not significantly affect trust levels. Similarly, the concept mean level, which reflects familiarity with key concepts, shows a positive coefficient (0.020) but is also insignificant (p-value = 0.56).

However, the type of institution is found to have a significant negative effect on trust levels, with a coefficient of -0.349 and a p-value of 0.01. This suggests that students from private institutions tend to have lower trust levels than those from public institutions. Lastly, the social technographic ladder, which measures social media engagement, has a small negative coefficient (-0.023) but is not significant (p-value = 0.21), indicating that levels of social media activity do not significantly influence confirmation bias or trust.

In conclusion, this study provides important insights into the prevalence of confirmation bias and trust in social media among Filipino students in higher education. The findings suggest that while students generally exhibit a moderate level of trust in familiar sources such as friends or respected figures, their trust in unfamiliar individuals or political entities remains relatively low. Moreover, respondents tend to engage more with content that aligns with their pre-existing

beliefs, reinforcing the presence of confirmation bias in their social media interactions. It is recommended that educational interventions promote critical thinking and media literacy to help students become more discerning consumers of information on social media. Addressing confirmation bias and fostering trust in reliable sources is essential for improving decision-making, enhancing academic discourse, and cultivating a more informed and analytical student community.

Keywords: digital trust, responsible use of technology, social media

Digital Citizenship and responsible Use of Social Media amomg Filipino Students in Higher Education Institutes

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Extended Abstract

Digital citizenship and responsible social media use are critical in today's world, with the number of social media users projected to grow from 3.6 billion in 2020 to 4.41 billion by 2025. Filipino students, particularly in Luzon, Visayas, Mindanao, and Negros Oriental, rely heavily on platforms like Facebook and Messenger for academic communication. This study explores digital citizenship practices among these students, focusing on etiquette, responsibility, well-being, and security alongside their responsible use of social media. These practices are essential for academic success, fostering critical thinking, ethical decision-making, and cultivating a positive digital presence, which benefits personal development and societal well-being.

Conducted between June and November 2023, this study involved teachers, college students, and librarians, with 111 survey responses analyzed. Respondents completed activity surveys from module 5 of a six-module open online course and a registration survey. Digital citizenship practices were measured on a 5-point Likert scale, with responses ranging from 1 (never) to 5 (all the time). A similar scale assessed respondents' familiarity with technology, tools, and operations, ranging from 1 (poor) to 5 (excellent).

The study utilized statistical tools to analyze demographic profiles, technological expertise, and responsible social media use. Frequency and percentage were used to describe the demographic breakdown and respondents' engagement with technology. The mean values evaluated respondents' familiarity with technology, while the mean of means determined their digital citizenship practices. A chi-square test assessed significant relationships between variables.

Of 111 participants, 87.39% were female and 12.61% were male. All respondents were from public institutions. Regarding technological engagement, the largest groups were "Spectators" (33.33%) and "Joiners" (29.73%), followed by "Creators" and "Conversationalists" (each 11.71%). A smaller number identified as "Critics," "Collectors," and "Inactives." Overall, respondents demonstrated a "GOOD" level of familiarity with technology, averaging a mean of 2.86. They showed the highest familiarity with "Social Media" (mean = 3.68) and "Becoming a Responsible Social Media User" (mean = 3.54). In contrast, their familiarity with topics like "Trolls" and "Deep Fake Technology" was rated as "FAIR."

The results indicate that respondents engage in digital citizenship practices "Frequently" (mean = 3.88). In terms of etiquette, they often avoid online conflicts, follow school mobile phone rules, and are mindful of others' feelings online. However, they sometimes lose their temper or engage in trolling (mean = 3.89). Regarding responsibility, respondents are frequently aware of copyright infringement and acceptable use policies, though some admit to occasionally downloading digital content without paying or submitting copied schoolwork (mean = 4.03). In mental wellness and physical health, respondents practice good posture while using computers but sometimes regret their posts or feel misunderstood online (mean = 3.77). For commerce, respondents are diligent when shopping online, reviewing transaction details, and securing receipts (mean = 4.14). In security, they frequently update their browsers and antivirus software, although some engage in risky behaviors like pretending to be someone else online (mean = 3.55).

The study presented scenarios about a first-time Facebook user to assess respondents' decision-making in digital contexts. In the first scenario, where the user was advised to create a Facebook account for a class, 65.77% of respondents provided correct advice, while 34.23% gave incorrect suggestions. In the second scenario, 77.48% of respondents correctly recommended how to help a friend venting about a teacher online. In a third situation involving a suspected theft, 69.37% suggested appropriate actions, while 81.98% identified responsible social media practices based on the scenario.

The chi-square test revealed no significant relationship between digital citizenship practices and responsible social media use (X^2 = 2.569, p = 0.63). However, a significant relationship was found between digital citizenship practices and gender (X^2 = 19.958, p = 0.00017), while no significant relationships were observed for the type of institution, technological familiarity, or technologic ladder.

Similarly, no significant relationships were found between responsible social media use and any socio-demographic variables, including gender, type of institution, technological familiarity, and technological ladder, with p-values exceeding the 0.05 threshold in all cases.

In conclusion, this study highlights that Filipino students demonstrate strong digital citizenship practices, particularly in etiquette, responsibility, and online commerce. However, there are still areas for improvement, especially in mental wellness and security. While gender influences digital citizenship practices, other socio-demographic factors, such as institution type and technological familiarity, show no significant effects. The lack of a significant relationship between digital citizenship practices and responsible social media use suggests these are related but distinct aspects of digital engagement.

To enhance digital citizenship and responsible social media use, institutions should implement targeted educational programs that address these areas as complementary aspects of student

development. Fostering responsible digital behavior and informed social media practices is essential for students' academic success, personal growth, and readiness for the digital professional landscape. Institutions must prioritize comprehensive digital literacy programs emphasizing ethical and responsible engagement in the digital world and enhancing technological skills.

Keywords: digital citizenship, responsible use of technology, netiquette,

Understanding and Practice of "Programming Education in Primary and Secondary education " as a Liberal Arts Subject

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Introduction

Information and information technology have become the foundation of modern society, and their importance is expected to continue to grow. As a result, many countries around the world have begun to focus on education in these areas (information education) throughout primary and secondary education.

In Japan, while this has not necessarily been implemented systematically or comprehensively until now, programming education has been made compulsory in elementary schools from the 2020 academic year and in junior high schools from the 2021 academic year.

With this change in education policy, higher education institutions also need to respond to the needs of a new generation of learners.

Tokyo Online University is a distance learning university that opened in April 2018. It is basically composed of video distribution (media classes) and practical classes and operates on a four-term system. The university consists of two faculties: the Faculty of Information Management and the Faculty of Human Welfare. While the majority of students were in their 30s and 40s when the university first opened, by the 2023 academic year, about 60% of new entrants were in their teens and 20s (Figure1).
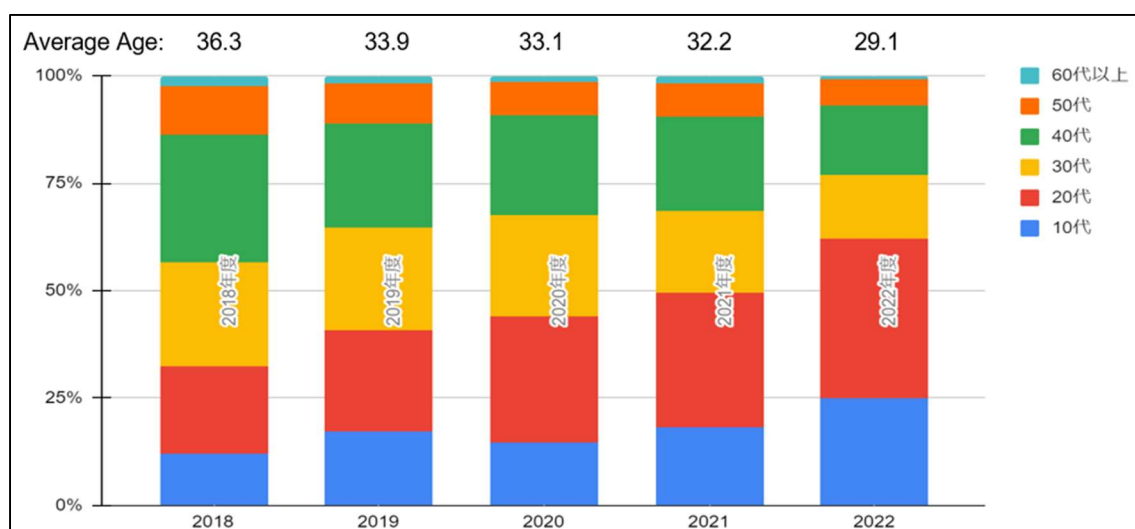
Figure1.Age Composition of Students at Admission (All Faculties)

Course Design

Course Overview

"Programming Education A" focuses on understanding the purpose and content of programming education, rather than acquiring programming skills. Students learn about the purpose of introducing programming education in elementary and junior high schools and the content of instruction, and through the practice of block programming, etc., they reflect on systematic information education throughout the primary and secondary stages, and consider the possibilities of programming and the structure of modern information society.

Course Objectives

The main objectives of this course are as follows:

- Understand the purpose of introducing programming education
- Grasp the content of programming instruction in elementary and junior high schools
- Learn the basics of programming
- Consider future social visions

Course Content

The course consists of the following main topics:

- History of programming and its education
- The concept of "information utilization ability"
- Programming in scripting languages (JavaScript)
- Block programming (e.g., micro:bit)
- Basics of computational thinking
- Information ethics and security

Teaching Materials and Practical Exercises

The course utilizes the following materials and exercises:

- Block programming environments such as Scratch and Blockly Games
- Learning the relationship between HTML files and websites
- Learning basic programming concepts using JavaScript (sequential processing, iterative processing, branching, etc.)
- Learning the concepts of variables and random numbers using micro:bit

Promoting Self-Learning

This course actively utilizes external free materials and is designed to allow students to engage in computational thinking and introductory programming even after the course ends, according to their interests.

Comparison with Previous Research

Current online programming education is offered in various formats such as game-based or video-based learning, primarily focusing on practical skill acquisition through coding. In contrast, this course adopts a unique approach that combines understanding of programming education with basic practical application.

In distance learning universities, automated grading systems are often implemented. Cyber University, for instance, conducts classes using Goorm IDE developed by codigm and Sharif-Judge created by Mohammad Javad Naderi.

Tokyo Online University provides an automated grading system called "coderoom" that supports C, Java, Python, SQL, and Blockly. Coderoom is a type of integrated development environment equipped with features such as file management, text editing, program compilation and execution, and grading.

Coderoom emphasizes communication, enabling not only Q&A sessions with instructors but also peer code reviews among students

Results and Discussion

The number of students enrolled in this course has maintained a consistently high level from the 2022 academic year to the 2024 academic year (2022: 1,008 students, 2023: 621 students, 2024: 904 students). In the post-course surveys, many positive comments were received, such as "My understanding of computational thinking has deepened." However, students with limited programming or computer knowledge expressed a desire for more detailed explanations. To address these challenges, we are considering enhancing self-study guidelines and supplementary materials to promote independent learning.

Conclusion

"Programming Education A" has achieved certain results as a liberal arts subject that provides an understanding of programming education in elementary and junior high schools and basic programming experience[1]. In the future, we plan to conduct follow-up surveys of students to evaluate the effectiveness of this course in more detaii..

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Behaviours and Attitudes of Students Towards AI Technology

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Abstract

The overall objective is to present the results of a quantitative study examining students' behaviors and attitudes toward AI technology.

Theoretical Background

Although artificial intelligence (AI) has appeared on the market relatively recently, it already has many applications. It is used in medicine, industry, marketing, finance, and science and cannot be excluded from education (Salas-Pilco & Yang, 2022; Zhai et al., 2021). Currently, there is no single definition of AI. The European Parliament has defined it as the ability of machines to exhibit human skills such as reasoning, learning, planning, and creativity. To some extent, AI can adapt its behavior by analyzing the effects of previous actions (European Parliament 2020). AI is bringing revolutionary changes to higher education, involving new ways of learning and acquiring knowledge (Walczak & Cellary, 2023). Therefore, it is essential to analyze students' attitudes and behaviors toward AI, and universities should provide instruction to students to increase student awareness of the benefits and risks of using AI-based tools (Katsantonis & Katsantonis, 2024), as well as develop regulations to determine to what extent the technology can be used in education.

Methods, Results, and Discussion

The CAWI method was used to conduct the research. The tool was an online survey. The study was conducted among 400 students from various Polish universities with multiple profiles.

Results show that students use AI most for homework (39%) and language translation (38%). One-third of them use AI to create presentations (33%), one-fifth to organize work (22%) and write term papers (20%). Quite a significant percentage (28%) of students declared that they do not use AI for any activities related to functioning at the university. However, in response to the question about the future use of AI, only 18% do not intend to use it. Similarly, according to Niescior et al. (2024), students use ChatGPT and other AI-based tools for various educational purposes: 78% declared using AI to solve tasks/assignments, 53% to help write essays/thesis/compositions, 51% to search for information, and 45% to translate text into another language.

Students have no clear opinion on whether AI technologies are more operative than other digital technologies (45%). Only 32% agreed that AI technologies characterized by human-like intelligence work more effectively than other digital technologies such as the Internet, IOT, Cloud, Big Data, and Blockchain.

Students assessed their competencies in the area of using artificial intelligence technologies. About half of them indicate that learning to use AI technologies is easy for them (47%) and that such technologies are simple to use (50%). As Venkatesh et al. (2023) state, students' perceived knowledge, skills, and attitudes affect the intention to use AI.

Half of the students believe that AI technologies have a lot of knowledge to be used, and 44% consider that these technologies can perfectly cope with the tasks given to them. Half of the students think that AI technologies have extensive knowledge regarding the required scope of their work. Also, nearly half state that they are well-specialized, which can increase their efficiency (45%). A significant proportion of students consider using AI technology as a pleasant and smart approach to performing tasks (51%). Some believe that AI technologies are distinguished by their diagnosis precision (40%). Many assume that AI technologies are characterized by a wealth of knowledge and information organization (51%) and support the formulation of suggestions (57%).

Many students have a positive (47%) or neutral (32%) attitude toward AI technology, and 42% would like to develop their competencies in using artificial intelligence as part of their university classes. These results confirm previous findings (i.e., Samukul et al., 2022; Haryanto, 2019; Muñoz et al. 2023). According to research by the Chalmers University of Technology, Swedish students have a positive attitude towards artificial intelligence. When describing AI chatbots, which are a source of knowledge and inspiration for them, they often refer to them as their tutors, teachers, mentors, or peers (PARP, 2023). Delcker et al. (2024) suggest that a positive attitude has a positive influence on the intention of use of AI-tools

Students maintain a neutral attitude towards trust in artificial intelligence and its honesty. Only a quarter believe that AI technologies are trustworthy in their actions, and 29% of students indicate that AI does not abuse the information and its advantage over its users. The most common response was "neither yes nor no" to statements regarding AI fairness. Twenty-six percent of students have a lot of confidence in AI technology skills, while 32% do not trust them, and 42% have no opinion. Likewise, Students are divided on the perception of AI safety. Thirty-two percent of respondents trust that their personal data is protected from potential misuse when using AI technology, but 33% do not show such confidence. In addition, 38% do not trust that the authorities exercise effective control over organizations and companies providing AI technologies, while 29% do. Over a third of students do not believe their privacy is effectively protected when using AI technology. Also, according to Amoozadeh et al. (2024)

students have various levels of trust in AI. Alzyoud et al. (2024) indicate that perceived trust significantly affects the willingness to accept AI in education.

Conclusions

The results showed that students use AI technologies for various study-related activities, and they plan to use them in the future. This may suggest that AI technology is already accepted mainly among this group and that there is a growing interest in it as a tool supporting effective management of duties. About one-third of students are convinced that using AI technology increases their capabilities in the surrounding environment, possibly due to positive experiences related to using this technology. Students believe they can easily acquire skills in using AI technology, which suggests that there is potential for increasing competence in this area. Such perception can contribute to expanded efficiency in performing tasks. Results indicate that beneficial experiences associated with using AI may significantly influence the perception of this technology in the future.

Students do not show a clear position on the issue of trust in artificial intelligence, its honesty, safety, and data protection while using it. The majority of surveyed students are cautious about using AI technology. This may be due to concerns about its operation, decisions, or lack of transparency.

Due to the non-representative nature of the research sample, the presented data is illustrative. However, it contributes to the existing literature and it can serve as a guide for stakeholders who want to encourage students to use AI in the future.

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Philipine Farmer`s Digital Assistant: a Web-based Land Preparation and Planting Information System

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Abstract

Philippines' agriculture is critical in sustaining livelihoods, particularly in rural communities (Food and Agriculture Organization (FAO). Despite the sector's importance, many farmers still rely on traditional methods, limiting productivity and resource efficiency. Integrating information technology (IT) into agricultural practices offers a significant opportunity to modernize farming, boost productivity, and promote sustainable practices (Babar, Akan, 2024). The Zamboanga del Sur Provincial Government College (ZSPGC), situated in Mindanao, has recognized this need, initiating a project to digitize land preparation and planting management for local farmers through a web-based system called the *Farmer's Digital Assistant*.

Keywords: Agricultural technology, Web-based systems, Sustainable agriculture, IT integration in farming, Farming Data management, Agricultural innovation.
Keywords:

Background and Problem Identification

The ZSPGC supports local farmers through initiatives such as the "plant now, pay later" program, which promotes organic farming. The program provides essential resources, including free equipment, seeds, organic fertilizers, and sustainable practices training. The College focuses on organic agriculture to improve soil health, ensure proper land preparation, and increase crop yields. However, despite these efforts, the current system for managing farmer information and resources remains inefficient. It relies on a combination of manual and basic computerized processes, making data management cumbersome and prone to errors. Farmers receive training on organic methods, including seed distribution and fertilization schedules, and the College assists with purchasing crops and organizing harvest schedules. Despite having computers, the College primarily uses them for basic tasks like desktop publishing, with records stored in spreadsheets and Word documents. The lack of an integrated digital system makes it difficult to manage large volumes of data effectively, track resources, and provide timely recommendations to farmers.

Project Objective

The *Farmer's Digital Assistant* was developed to address the inefficiencies in the College's current system and improve agricultural operations. The project's primary objective is to create a web-based platform that streamlines land preparation, planting, and resource management. The system automates key processes such as ordering seeds and farming equipment, tracking crop progress, managing farmer records, and providing real-time recommendations. Doing so aims to enhance communication between the College and farmers, improve data management, and support more sustainable farming practices.

Method

The study employed both descriptive and software development methodologies. Data were collected through questionnaires and interviews with farmers and the College's agriculture department staff. The farming methods and guidelines from departmental documents were analyzed to inform the system's design. The development followed the waterfall model, which involved distinct phases, including requirements gathering, system design, implementation, testing, and deployment.

The system was developed using PHP for web development, MySQL for database management, and Lucidchart for creating diagrams. It was designed to automate tasks such as calculating seed and fertilizer requirements based on planting area, generating crop monitoring reports, and providing tailored recommendations to farmers. The input-process-output framework was used to structure the system, ensuring that each function—such as registration, monitoring, and ordering—worked efficiently and delivered the expected outcomes.

Results and Discussion

The *Farmer's Digital Assistant* significantly improves the existing manual system at ZSPGC by automating various agricultural processes. Key modules of the system include:

1. Ordering and Reservation Module: Farmers can easily order seeds and farming equipment. The system tracks availability and allows farmers to reserve equipment, improving the management of resources.

2. Monitoring Module: This module tracks real-time crop growth and borrowed equipment. Farmers can input data on crop status, and the system provides updates and recommendations on crop management, improving decision-making and resource allocation.

3. Harvest Calculator: The system automatically calculates the optimal number of seeds, fertilizers, and pesticides needed based on the size of the planting area. It also estimates harvest dates, allowing farmers to plan labor and resources more effectively.

4. Analytics and Visualization Tools: The system provides real-time insights into farm productivity, crop status, and resource utilization through graphical reports. These tools help farmers and administrators identify trends and make informed decisions to optimize farming practices.

5. Notification Module: Farmers receive timely notifications about their orders, crop health, and recommendations. This ensures that they stay informed and can address issues as they arise.

6. Sales Module: This module records sales transactions, providing a centralized platform for managing sales data. It enables seamless communication between farmers and the College, ensuring accurate tracking of harvested crops and revenue.

Testing of the system with both administrators and farmers demonstrated its effectiveness. Administrators noted that the system streamlined processes, particularly data management and communication with farmers. Farmers found the system user-friendly and reported that it simplified tasks such as ordering equipment and monitoring crop health. Test results showed high satisfaction in key areas such as registration, monitoring, and ordering, with strong feedback supporting the system's user-friendly interface and functionality.

Conclusion

Implementing the *Farmer's Digital Assistant* offers a promising opportunity to enhance agricultural practices in the Philippines. The system provides farmers with actionable insights on land preparation, crop management, and resource use, fostering more sustainable and productive farming methods. By integrating IT into agricultural operations, the College can help farmers improve yields, reduce environmental impact, and strengthen their livelihoods.

The system's modules—ordering and reservation, monitoring, harvest calculator, analytics, and sales—modernize agricultural operations, improving resource management and decision-making. The ability to track crop status, receive real-time recommendations, and manage transactions through a centralized platform enhances efficiency and communication between farmers and the College.

Recommendations

It is strongly recommended that the ZDSPGC College of Agriculture implement the *Farmer's Digital Assistant* as soon as possible, ideally at the beginning of the new year. This timing would allow for a smooth transition, enabling the College to start fresh with record-keeping and conduct thorough testing. Delaying implementation could diminish pilot users' enthusiasm and slow the system's adoption.

Furthermore, the College should implement a training program for staff to ensure they are proficient in using the system. A parallel run of the manual and digital systems for at least one month is recommended to identify any challenges and refine processes. Future projects should follow a prototyping model, as hands-on experience with the system during development leads to better-defined requirements. By adopting this web-based system, ZDSPGC can greatly enhance its support to farmers, improve agricultural efficiency, and contribute to the sustainability and prosperity of farming communities in the Philippines.

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Smart City Concept for Small-Town country-side Cities

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Abstract

This literature paper is a non-systematic literature review on smart cities, e.g. for small town and country-side cities. The aim is to give an overview on the latest research. It is the basis for discussion with representatives in the city of Uelzen, Germany.

Introduction

Smart city initiatives are being implemented worldwide to tackle long-term urban challenges and enhance residents' quality of life (Camero, A.& Alba, E., 2019). Cities are also expected to address global challenges like sustainability, decarbonization, and resilience (Yigitcanlar et al., 2019). These initiatives span various fields, including sustainable infrastructure development, new mobility solutions, smart urbanism, citizen participation, city governance, and sustainability efforts (Voytenko et al,. 2016). While their goals, technologies, and priorities may vary, they all share a common belief in the transformative potential of digital technologies as a key driver for positive and sustainable urban development (José & Rodrigues, 2024).

Lately we recognize a drastical change in small countryside cites due to rapid urbanization. Millions of people joining urban and small town areas each year, cities are expected to dominate the planet by the second half of this century (Grayman et al. 2012). Researchers at MIT Media Lab estimate that by 2050, up to 80% of the global population will live in cities, which will account for 90% of population growth, 80% of economic output, and 60% of total energy consumption (Larson et al. 2012; (Portmann & Finger, 2015).

Providing services in Smart Cities demands new governance and strategies. The rise of Smart Cities stems from their increasing societal importance and the availability of technologies that enable both new and traditional ideas (Townsend 2014). By combining ubiquitous computing (sensor technologies and analytics) with modern governance models, data-driven approaches can improve city planning and management (Manville et al. 2014). Ubiquitous computing, supported by the Internet of Things (IoT), helps people without being disruptive (Portmann & Finger, 2015).

Cities are complex, nonlinear systems that grow unpredictably. Designing Smart Cities with a rigid economic approach focused on equilibrium is ineffective (Sennett 2012). Instead,

leveraging new technologies through open, adaptive systems emphasizes coordination over strict regulations. The Internet, as the backbone of Smart Cities, supports this coordination, with the Internet/Web of Things acting as a crucial component (Townsend 2014).

Connecting stakeholders like residents, businesses, politicians, and NGOs through the Internet and Web offers a way to manage the complexity of cities, which is shaped by emergence, nonlinearity, and self-organization. The Internet enables new forms of collaboration and interaction (Portmann & Finger, 2015).

Collective intelligence is crucial to Smart Cities, driven by the Internet/Web creating an interconnected environment for stakeholders. This expands online connections, often blending into the physical world (Caine and Caine 2011). Enhanced collective intelligence emerges from the synergy between humans and computers (Portmann, 2013), where intelligence is viewed as a group phenomenon involving people, computers, or both.

Internet and web technologies are transforming cities into Smart Cities (also called Digital, Intelligent, or Ubiquitous Cities). This shift requires collaboration across various fields such as architecture, urban planning, computer science, politics, and sociology. A holistic approach that integrates these disciplines is vital for the cities we will live in.

Definition of Smart City

In a recent study by Hajek et al. (2022), over 100 articles on smart city assessments were analyzed, revealing three main approaches: (i) cities shaped by technology, (ii) cities that emphasize people, and (iii) cities that integrate both technology and a human-centered approach. Over time, the focus has shifted towards human-centered and "soft" infrastructure, such as institutions, citizen engagement, and social innovation (Sharifi, 2019).

According to the literature, smart cities are defined across six key dimensions: economy, people, governance, mobility, environment, and living (Concilio et al., 2013; Hajek et al., 2022; Koca et al., 2021; Lazaroiu & Roscia, 2012). These dimensions cover areas such as entrepreneurship, equality, participation in public life, transparent governance, sustainable transportation, resource management, and quality of life. Smart cities rely on information and communication technologies (ICT) to enhance these dimensions and create more efficient, sustainable urban environments.

Information and communication technologies (ICTs) are central to the smart city concept, facilitating integration across city dimensions by creating connected platforms for stakeholders (Airaksinen et al., 2018). ICT enhances city operations' efficiency, competitiveness, and capacity, providing new insights and services (Angelakoglou et al., 2019). Smart cities use ICT to promote sustainable development and improve quality of life (Hajduk, 2020).

The main objectives of smart cities include solving urban challenges like energy consumption, environmental protection, and quality of life (Angelakoglou et al., 2019; Patrão et al., 2020).

According to Sharifi (2019), smart city projects help cities remain competitive, attract talent, address sustainability issues, transition to a low-carbon society, improve urban management transparency, and tackle socio-economic challenges (Karal & Soyer, 2024).

Characteristics of a Smart City

A city becomes smarter by gathering and utilizing high-quality data (Hurwitz et al. 2015). Internet- and web-based services analyze urban data, or Big Data, making it accessible to stakeholders. Machine learning helps process unstructured data, while sensors monitor city conditions, enabling Ubiquitous Computing, where AI is integrated into the physical environment (Portmann & Finger, 2015):

Smart Cities require more than just technology. To address rapid urbanization, new strategies are needed to manage complexity, boost efficiency, lower costs, and enhance quality of life (Razaghi and Finger 2015).In the following, we will briefly outline the individual characteristics, which will be discussed in more detail in the subsequent articles of this issue.

Smart Place is a location (e.g., building, space, or event) that facilitates and promotes interaction and connectivity between people, places, and the web through communication, multimedia, and technology. This human-place-web triangle will increasingly shape our lives, with Ubiquitous Computing technologies defining how we interact within self- or externally defined spaces

Smart Living involves housing concepts that leverage connected devices to offer new possibilities. These concepts often align with the sharing economy, contributing to the implementation of Shareable Cities.

Smart Work refers to future work environments that are planned intelligently using Big Data. This can lead to economically motivated sharing concepts, provided they respect individual privacy (Smart Privacy).

Smart Mobility encompasses intelligent public and private transportation, rooted in the sharing economy but including additional public transport services. Holistic concepts address both individual and public transportation.

Smart Logistics focuses on flexible storage and delivery. In the future, logistics will become highly personalized, with deliveries reaching stakeholders wherever they are, thanks to Ubiquitous Computing services.

Smart Traffic Management uses dynamic information and complex event processing to enable self-regulating traffic systems, such as traffic lights that adjust green and red times autonomously.

Smart Environment is based on Ubiquitous Computing, connecting networks with the physical world. This concept enables services that help address aging populations, such as supporting independent living for seniors or those with dementia (Smart Healthcare).

Smart Energy involves the intelligent production and distribution of energy, with models encouraging stakeholder participation. Future energy grids will use Big Data to automatically adapt, improving efficiency, reliability, and sustainability.

Smart Democracy relies on transparency, a key principle that can be enhanced through the intelligent use of internet and web technologies, such as systems that provide smart voting recommendations.

Smart Community uses internet and web technologies to shape urban life and work, emphasizing local engagement and stakeholder collaboration.

Other key features include Smart People, who navigate the online environment freely and have access to continuous education (Manville et al. 2014), making them vital for Smart Cities. The Smart Environment concept also includes Smart Healthcare, which focuses on intelligent services to improve health and well-being (Hurwitz et al. 2015). Smart Work addresses Smart Privacy, ensuring both physical and digital privacy (Kelly and Ham 2013). Smart Security covers both physical and digital protection, while integrating water and waste management with web technologies fosters sustainable urban governance (Manville et al. 2014).

Challenges of Smart Cities

The pace of innovation in Smart Cities appears to lag behind the rapid and disruptive transformations driven by digital innovation in other sectors. While other domains have experienced swift changes, the development of Smart Cities seems to be moving at a slower rate, possibly due to the complexity of urban systems, regulatory challenges, and the need for broad stakeholder coordination (José & Rodrigues, 2024). The connection between major smart city challenges and the essential properties of digital innovation needs to be analyzed. José & Rodrigues (2024) describe five key challenges for innovations for smart city: Strategic vision; Organizational Capabilities and Agility; Technology Domestication; Ecosystem Development; and Transboundary Innovation.

Strategic Vision

A strong strategic vision is crucial for smart city initiatives. Sánchez-Corcuera et al. argue that relying solely on isolated initiatives won't achieve long-term goals or foster collaboration. However, the ambiguity, technological uncertainties, and disruptive impacts of this shift make it challenging for cities to gather the necessary drive, knowledge, and support for a cohesive digital transition. Despite differing views on what a smart city should be, the vision must reflect community priorities, demonstrate strong leadership, and be deeply rooted in local understanding (Ben Letaifa, 2015). The complexity and uncertainties, coupled with limited proven models, require bold decisions in a rapidly changing environment (José & Rodrigues, 2024).

Organizational Capabilities and Agility

The digital transition marks a major shift in city management, requiring new analytical, administrative, and political capabilities, along with more transparent infrastructure governance across sectors and scales. Even with a strong strategic vision in place, cities must significantly adapt their governance processes to align with this new reality. Often, challenges such as organizational misalignments, resistance, and unmet expectations are underestimated, complicating the path forward (Ramaswami et al, 2015).

Technology Domestication

The central idea of smart cities is that ICT will play a key role in city operations and various aspects of urban life. However, the specific ways these technologies will create value for cities are often vague or misunderstood. Too much emphasis is placed on the technology itself, rather than on how it integrates into the city's structure. The real challenge lies in balancing technological potential with the actual value derived from its practical application (José & Rodrigues, 2024; Rogers, 2003).

Ecosystem Development

A common approach in smart city initiatives is building a local innovation ecosystem. This helps local governments access financial resources, innovators, skilled workers, and shared knowledge. By promoting collaboration between stakeholders, such ecosystems foster innovation and generate value from connections between research, communities, businesses, and technology. However, while their importance is widely acknowledged, no ecosystem can fully solve all the challenges of smart city development (Gupta, Mejia & Kajikawa, 2019). Additionally, creating and maintaining such ecosystems presents its own challenges, which can be grouped into four key areas: collaborative innovation, governance models, business models, and citizen engagement (Ferraris, Santoro & Pellicelli, 2020; José & Rodrigues, 2024).

Transboundary Innovation

The previous section highlighted the importance of local ecosystems in turning smart city concepts into concrete policies (Komninos et al, 2022). However, survey results indicate that an overemphasis on local innovation can lead to a fragmented urban innovation landscape (Wang, 2019). This fragmentation, with isolated ecosystems independently addressing similar challenges, creates inefficiencies and limits the collective impact. The key challenge for smart city initiatives is finding ways to foster collaboration, enabling combinatorial innovation and shared learning to consolidate successful practices and accelerate progress (José & Rodrigues, 2024; Yoo et al., 2012))

Performance Indicators for Smart Cities

Karal & Soyer (2024) analyzed and evaluated studies on smart cities, offering a framework for measuring the smartness of urban areas. Measurability, availability, completeness, relevance, independence, reliability, currency, responsiveness, simplicity, representativeness, cost-effectiveness, consistency, comparability, and consensus were among the criteria identified from the literature set to distinguish performance indicators. Data quality emerged as a primary concern in selecting performance indicators. Indicators were chosen based on whether their data was measurable by various methods, easily accessible, trustworthy, verified, and current (Karal & Soyer, 2024). The most commonly cited criteria for selecting indicators in the literature were measurability, availability, reliability, and representativeness. Standards from credible organizations like ISO, OECD, and the European Environment Agency, along with previous literature, were utilized to create reliable performance measurement systems. Two commonly used models were the ISO 37120 standard, with 104 indicators across 19 dimensions, and the "Smart Cities: Ranking of European Medium-Sized Cities" report by Giffinger et al. (2007), which includes 74 indicators across 6 dimensions. The construction of measurement systems for evaluating smart sustainable city performance can vary depending on the city, available data, or the decision-makers' approach. Most studies have used an expert-led approach, drawing on indicators from existing literature on smart and sustainable city performance. This highlights the need for more citizen-led and globally-focused approaches to performance measurement systems (Karal & Soyer, 2024).

Smart Cities and Sustainable Development

In 2015, the United Nations launched the Sustainable Development Goals (SDGs) to tackle growing global socio-economic and environmental challenges and promote more sustainable pathways for future generations (Habitat, 2021). Despite extensive research on smart cities, there is a lack of studies exploring the connections between smart cities and the Sustainable Development Goals (SDGs). Specifically, limited research exists on how smart city solutions can generate co-benefits or trade-offs in achieving SDGs. A systematic literature review by Sharifi et al. (2024) aimed to address that gap. A systematic literature review was conducted to address this gap. The findings indicate that the responsible development and implementation of smart city solutions and technologies can contribute to progress toward achieving the SDGs. However, they focused on SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 7 (Affordable and Clean Energy), and SDG 6 (Clean Water and Sanitation). The review revealed a bias toward highlighting the benefits of smart cities, such as boosting economic growth, enhancing efficiency, fostering innovation, and raising citizen awareness. These advantages suggest that smart cities could drive sustainable development and help address climate change. However,

to fully realize these benefits, it is essential to address trade-offs, including privacy and cybersecurity concerns, infrastructure costs, rebound effects from efficiency gains, biased decision-making, social inequalities, the digital divide, AI misuse, and insufficient legal frameworks (Sharifi et al., 2024).

The growing focus on urban transformation as a key factor in achieving the SDGs has spurred significant research, emphasizing the pivotal role cities play in driving global change. A report by the OECD (2022) highlights that many cities have developed policies and frameworks to guide sectors such as water, housing, climate change, and transport, all of which are critical to the SDGs. Cities are often more flexible and innovative than central governments, making them better positioned to implement transformative sustainability actions (Masuda et al., 2022). Additionally, local governments are seen as ideal candidates for achieving the SDGs due to their ability to learn from peers and develop tailored policies for local challenges (Leavesley, Trundle, & Oke, 2022).

Despite these advantages, implementing SDGs at the city level remains challenging, as they are primarily designed for national adoption. Several studies have pointed out the limitations of existing indicators for measuring SDG progress in cities, particularly for SDG 11, which focuses on sustainable cities (Berisha, Caprioli, & Cotella, 2022; Koch & Krellenberg, 2018). Therefore, further research is needed to identify effective planning models that align with past agendas, like the Brundtland report (1987), and support SDG achievement at the urban level.

One promising model is the Smart City, which leverages smart technologies for city planning, management, and operations. Evolving from earlier concepts like digital and knowledge cities, smart cities now encompass a broader scope. While initially technology-focused, non-technological aspects such as social innovation and institutional frameworks are increasingly recognized as essential to enhancing quality of life, addressing global challenges, and driving sustainable development (Sharifi, 2019).

Sustainability and smartness are closely connected. A comprehensive analysis of city labels shows that "sustainable city" and "smart city" frequently co-occur (Schraven, Joss, & de Jong, 2021). While some smart city policies may not always align with sustainability goals, such as reducing CO2 emissions (Yigitcanlar & Kamruzzaman, 2018), other studies highlight how smart cities can support achieving the SDGs (Schraven et al., 2021).

However, failing to link sustainability with smartness in urban development can lead to risks, including short-term priorities, elitism, and commercialization overshadowing environmental concerns (Yigitcanlar et al., 2019). Given this, the potential of smart cities to contribute to SDGs has gained growing recognition (Deloitte, 2020). Some researchers, like Visvizi and del Hoyo (2021), suggest that smart cities' technological features enable real-time monitoring of SDG indicators, supporting targeted program implementation. Additionally, tech-enabled governance in smart cities enhances citizen participation, crucial for achieving SDGs.

Smart cities also promote resource efficiency, such as alternative mobility solutions to reduce fossil fuel dependence and the use of sensors and smart devices to optimize water and energy consumption through smart metering (Talari et al., 2017; Sharifi et al., 2024)

The Example China

China is a leading country in researching the evaluation of smart and sustainable cities. This is driven by factors such as the communist regime (Sustainable Development Goals Knowledge Platform, 2021), an increasingly unstable economy in the past (Roach, 2019), and challenges from rapid urbanization (Wang et al., 2020; Yi et al., 2022). Additionally, China's commitment to the 2030 Agenda's economic, environmental, and social goals plays a key role. With a holistic approach, China funds sustainable development actions, implements integrated strategies, and promotes public participation and innovation through various projects and programs (Jiang, 2020).

Conclusion

The article shows a summary of the latest research on smart cities.

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Sustainability and Corporate Social Responsibility

Exploring Corporate Social Responsibility Significance, Practices, and Challenges encountered by the Hotel Industry in Calabarzon, Philippines

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Extended Abstract

The hospitality industry plays a crucial role in supporting the tourism sector and local economies, particularly in popular tourist destinations (Gador, 2019). Corporate social responsibility initiatives undertaken by hotel establishments can have a significant impact on the sustainability of the industry and the communities they operate in (Borbon, 2020).

This study aimed to propose a framework of commitment for enhancing corporate social responsibility (CSR) in the hotel industry in the CALABARZON region. The research specifically sought to: (1) present the profile of the hotel industry in terms of accommodation classification, location accessibility, and years of operation; (2) describe the significance of CSR in terms of economic, legal, ethical, and philanthropic aspects; (3) identify the CSR practices of hotels concerning environmental efforts, philanthropic activities, social engagement, and ethical labor practices; and (4) examine the challenges faced by accommodation establishments in complying with CSR, including political, economic, and social issues. Additionally, the study tested differences in CSR significance, practices, and challenges based on the hotel profiles, examined the relationship between the significance and practices of CSR, and explored the link between CSR practices and the problems encountered.

A descriptive research design was utilized, with the respondents being employees from Department of Tourism (DOT) accredited hotels, resorts, and tourist inns in CALABARZON. Out of 76 accredited establishments, 45 (59.2%) participated in the study, representing various classifications of accommodations such as hotels, resorts, hotel resorts, and tourist inns. A total of 130 respondents from these 45 establishments provided data through surveys, interviews, and focus group discussions.

The research used an adopted questionnaire divided into two parts: one profiling the respondents, including accommodation classification, accessibility, number of employees, years in operation, and guest volume; the second assessing the CSR significance, practices, and problems encountered. The questionnaire was adapted from studies grounded in Carroll's CSR framework (Carroll, 2016) and underwent reliability testing, yielding strong internal

consistency with Cronbach's alpha values of 0.960 for CSR significance, 0.929 for CSR practices, and 0.898 for CSR challenges.

Key findings revealed that most hotel establishments were located in coastal areas of Batangas and had been in operation for 6-10 years. Employees perceived CSR, especially in its philanthropic aspects, as highly significant, while environmental-related efforts ranked highest among CSR practices. Economic issues, particularly climate change and population growth, were the most commonly encountered problems, aligning to the previous study of Akhouri & Chaudhary, (2019); Simmou et al., (2022); Aminudin, (2013). Resorts showed significantly higher views on the legal aspects of CSR and higher levels of CSR practices compared to tourist inns. Furthermore, establishments in operation for 6-10 years had fewer social issues compared to others. The study also highlighted that a higher perception of CSR significance, particularly in ethical and philanthropic aspects, corresponded to a higher level of CSR practices. However, higher CSR practices were also linked to increased economic challenges, aligning to the previous study of Zheng & Siddik, (2022). Based on these findings, a framework of commitment was proposed to guide the continuous improvement of CSR in the hotel industry.

The study recommends appointing a CSR officer within the public relations or human resources departments to monitor CSR activities and assess their economic impacts. It also suggests implementing points and reward programs to encourage employees to actively participate in community CSR initiatives. To further strengthen CSR efforts, universities in CALABARZON should enhance their CSR programs and integrate these into their curricula to expand students' commitment to CSR principles. Additionally, the hotel industry should focus on climate change and pollution by developing awareness programs aimed at protecting the environment. The study also proposes that CSR implementation be considered as an additional requirement for DOT accreditation of hotels, resorts, and tourist inns. The proposed CSR framework should be submitted to the Department of Tourism - CALABARZON for dissemination and distribution to hotel industry respondents to ensure continuous improvement of CSR efforts. Lastly, it recommends future research to explore the level of employee participation in CSR activities and its impact on community development.

This study contributes to the body of knowledge by providing a structured approach to improving CSR in the hotel industry and offers practical recommendations for stakeholders in CALABARZON. Further studies are recommended to explore broader aspects of employee involvement and the long-term impact of CSR initiatives on community and environmental sustainability.

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A Literature Study on the Use of Ancestral Seeds in the Application Kitchens of Universities within the Scope of Sustainable Gastronomy Practices

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Abstract

Due to the inequitable distribution of food in the world and the overuse of resources, it is predicted that the ability of future generations to consume healthy and organic products may become a major problem. As the needs of individuals are unlimited and natural resources are limited, there is a gradual decline in natural resources. Due to the rapid increase in economic growth and global population, the demand for resources to meet societal needs is increasing day by day. The supply of organic and healthy food in the world is becoming a problem on a global scale. Ensuring the sustainability of organic products in the food and beverage production process is of great importance in terms of transferring the material, spiritual and cultural gains of the society to future generations. It is seen that the formation process of organic products multiplies through seeds as in all living things. While preserving the genes of the past, where seeds are a time capsule, they also play a major role in transferring them to the future. The loss of seeds means the loss of both our food culture and our future. For this reason, the protection and reproduction of seeds is one of the rights that we are responsible for our future generations. Ancestral seeds, which are of great importance for the sustainability of organic products from the past to the present, are one of the heritage that should be valued today in terms of the sustainability of the products inherited from our ancestors. Thanks to ancestral seeds, it is seen that the sustainable development approach has come to the agenda and as a result of the developments experienced, an institutionalized and culturally established scope and structuring has been achieved. In this process, it is seen that the effects and results of concrete practices at local, regional and national level can be observed in the organic product production process. In this context, the main purpose of this study is to raise awareness about sustainability, organic nutrition, organic food, local production and local product production, local dishes, cultural heritage-oriented courses in the education process of gastronomy and culinary arts, cookery, agricultural engineering fields and to reveal why the issue of sustainability is so important. In addition, it is aimed to reveal whether this awareness is gained in the kitchens and courses of the relevant departments of universities, what the

opinions are, and in which areas it is used. In addition, in this study, the curriculum information of associate, undergraduate and graduate programs in the departments of Gastronomy and Culinary Arts, Cookery, Agricultural Engineering in faculties and colleges in Turkey and in Berlin, Florida, Germany were examined and the faculties and colleges with course content on sustainability were included in the study. For this purpose, in the 2024-2025 academic year, academicians and students who received education in associate, undergraduate and graduate programs within the faculties were reached.

Keywords: Sustainability, Gastronomy Practices, Agriculture, Ancestral Seeds, Gastronomy and Culinary Arts

Introduction

Global warming, increasing population growth, unconscious and excessive consumption, and the danger of depletion of natural resources are among the biggest problems today. For this reason, organic production, organic nutrition and ancestor seeds are on the agenda today. Due to the decrease in food resources as a result of overconsumption and the resulting increase in prices, it has become a problem that concerns individuals as well as businesses and individuals trained in the field of food and beverage. For this reason, the preservation of ancestor seeds for organic and healthy nutrition and their use in the product production process will positively affect the costs of both food resources, businesses and individuals receiving education in the food production process (Ozcicek Dolekoglu, 2017). It is necessary to support the production of ancestral seeds in order to prevent and reduce negative impacts on food resources.

It is considered as a need in the perspective of sustainability that institutions providing education in the field of gastronomy and culinary arts provide rich information in order to contribute to the sustainability of natural and environmental resources. The concept of sustainability, which has been emphasized in a global framework especially in the late 20th century, has become a basic requirement for meeting the individual needs of future generations. In this context, it is important in terms of sustainable food production by ensuring long-term and optimum productivity in order to maintain the balance of resources and needs. In this context, it is possible to mention that there is an increasing interest in issues related to sustainability in the capacity of future generations to provide access to the same resources while meeting the needs of the current generation with the use of ancestor seed in sustainable culinary practices. When the researches on sustainability in the field of gastronomy are examined, it is possible to mention that studies on issues such as eco-gastronomy, geographical marking, waste management and waste reduction, supply chain, green restaurants and green practices, slow food and local food stand out (Yurtseven & Kaya, 2011;

Durlu, 2013; Cekal & Dogan, 2022; Baran & Karaca, 2021; Güngör & Alperen, 2021; Serkan & Kılıç, 2022; Ertaş, 2022; Yüceer, 2019; Keskekci & Gençer, 2023; Bilgin & Akoglu, 2018; Demir, 2021). In this context, it is seen that providing production and product supply with ancestral seeds is of great importance in terms of reducing the negative environmental impacts of the sector in order to ensure the sustainable use of natural resources and the effective use of ancestral seeds for individuals who study and receive education in the fields of gastronomy and culinary arts, cookery and agricultural engineering (Axelos, 2018).

The strategic adoption of environmental sustainability practices in culinary practices in the food sector will contribute to more effective management of natural resources and minimization of negative environmental impacts. In line with this information, the aim of the study is to increase the importance and value of ancestral seeds in culinary practices and research in the relevant departments of universities where the use of ancestral seeds in sustainable gastronomy will be expanded. For this reason, a questionnaire form was applied to learn the attitudes and perspectives of faculty members and students in the relevant departments of universities in Turkey and abroad.

Conceptual Framework

The Concept of Sustainability

Sustainability is defined as the ability of a process to conserve natural resources while meeting the needs of the current generation and leaving a healthy environment for future generations (Collin, 2004; Meneguel, 2019; Kuşat, 2013). This concept, which has been addressed in a multifaceted manner in the fields of development, applied science, environment and international politics in international environmental debates since the 1980s, has gained more importance and become a focal point today. However, there is still little consensus on the implications of development strategies or the meaning and definition of sustainability (Carvalho, 2001). Another definition defines sustainability as the capacity of a society, ecosystem or any system to continue to function into the indefinite future without depleting or overloading its basic resources (Gilman, 1992). This definition emphasizes the balanced use of natural resources in order for systems to continue their existence in a sustainable manner. The concept of sustainability is generally shaped on three basic building blocks: environmental, economic and social sustainability (McKeown et al., 2002). Environmental sustainability is concerned with the conservation of natural resources and the continued healthy functioning of ecosystems, while economic sustainability argues that development should be economically sustainable, meaning that economic growth should take place without harming long-term sustainable development goals. Social sustainability aims to sustain the well-being of societies over the long term, based on social equity and justice. These three building blocks draw attention to the fact that sustainability should be addressed by taking into account not only

environmental but also social and economic dimensions. These interconnected elements show that sustainable development has profound impacts not only on ecosystems and natural resources, but also on social and economic structures. Therefore, these three dimensions need to be considered in a balanced manner when formulating sustainability strategies (Lehtinen, 2012; Bagheri et al., 2008; Kuhlman and Farrington, 2010). Providing these three elements in a balanced manner will contribute to the sustainable use of resources, poverty reduction and the protection of ecosystems (Harris, 2000; Collin, 2004).

Although the concept of "sustainability" first emerged in the 1970s, it was officially defined in 1987 in the "Our Common Future" report published by the United Nations-sponsored World Commission on Environment and Development (WCED). In this report, sustainability was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". In the report, the goals for sustainable development are listed as follows (WCED, 1987):

➢ The concept of sustainability aims to re-evaluate major environmental and development problems and to make realistic proposals to address them.

➢ In this framework, it is important to establish international cooperation methods to contribute to the development of policies that can make the necessary adjustments to solve the problems. It is also necessary to increase the interest of voluntary organizations, individuals, businesses, institutes and governments in sustainability.

➢ This approach seeks to protect the future and enhance existing values in order to ensure that human needs are met and that the current needs of residents and tourists are met.

Sustainable development policies focus on assessing the possible consequences of current decisions by considering the needs of future generations and are based on the principle of sustainability. The understanding of sustainability aims to preserve the environmental balance by minimizing the consumption of natural resources, to ensure fair and equitable economic development and to increase social welfare. Therefore, sustainable development emphasizes the need to develop a comprehensive and holistic approach to respond to today's complex challenges. It aims to build a better future for humanity, taking into account not only environmental but also social and economic dimensions. In this context, sustainability assumes the responsibility of both meeting the needs of current generations and leaving a healthy and balanced world for future generations (Damtoft et al., 2008; Mebratu, 1998). In addition, the sustainable use of natural resources, namely water, minerals, forests and energy resources, and long-term investments in these resources make an important contribution to sustainability (Lovins, 2007). Sustainability is basically addressed in three stages. These are sustainability in production, sustainability in consumption and post-consumption sustainability (Veleva, 2021). Considering these three stages together is essential for achieving sustainable

development, and the integration of all these elements contributes to both protecting the natural environment and increasing social and economic welfare (Lemanowicz, 2020).

The Relationship between Sustainability and Gastronomy Practices

Today, sustainability practices are an innovative approach in gastronomy and food applications (Pereira, 2019). It is seen that many chefs around the world prefer materials and products with sustainability features, pay attention to organic farming and organic product production, pay attention to the use of micro sprouts, consume products produced from ancestor seeds and find it valuable to benefit from the product preparation process. For this reason, it is seen that they generally pay attention to using local and organic ingredients or products that reflect regional traditional culture (Pereira, 2019; Zaneti, 2017). The connection between gastronomy practices and sustainability, how to prepare the dishes to be prepared, where and under what conditions the ingredients will be produced, what to pay attention to in the process of preparing sustainable products and how to provide products to culinary students in the field of gastronomy and culinary arts, It includes many issues such as whether meals are prepared with products consisting of ancestral seeds in applied courses, how much organic and local products are preferred, what are the environmental impacts in the process of supplying organic and healthy products regionally, and the level of employment in the process of producing ancestral seeds and organic products (Pereira, 2023). Sustainable gastronomy practices are basically based on the sustainable sourcing of ingredients and attention to their processing in application kitchens (Un, 2024). In this context, sustainability in the process of organic agriculture and organic product production should include policies and practices that contribute to the production of local and local, ancestral seeds and products that contribute to fairer and environmentally friendly local development (Lopes, 2019). In this way, it should be aimed to ensure the sustainability of these policies in the trainings given in the field of gastronomy, cookery and agriculture. Under the leadership of the Food and Agriculture Organization of the United Nations (FAO), within the scope of "Sustainable Gastronomy Day", based on culinary practices that do not harm the health of consumers and the local and local universe, those who provide education in this field and chefs working in the sector should address how the ingredients are obtained, where they come from, how they are grown, how they should be grown, the importance of the ancestor seed, how they can spread to the international market by having a say in the niche market, and ultimately how they reach from soil to table in the trainings and events they carry out on the sustainability of gastronomy (Sternadt, 2021).

Consumption and production of organic and healthy products form the basis of sustainable culinary practices. It is important for those who will operate in this field to utilize the Ancestor seed in the process of supplying healthy products from soil to table (Hall and Sharples, 2024). Local and regional food consumption, which is an important attraction point for consumers,

has a significant economic contribution in the tourism sector (Kim, 2012). It is thought that the use of ancestor seeds in these foods will help to create a sustainable touristic product that increases tourist spending regionally and extends the tourism season (Everett & Aitchison, 2008). Research shows that tourists allocate a significant budget for food and beverage expenditures in their travel choices (Okumuş & Çetin, 2018; Kim, 2020). With the increase in competition in the field of gastronomy and agricultural engineering in the global sense, it is thought that the use of ancestor seeds in the process of preparing organic products and local dishes will have a positive effect on the visitor attraction strategies among the destination choices of tourists in the tourism sector in the region (Dedeoğlu, 2020; Mariani, 2021; Soltani, 2021). In this context, it is thought that individuals who receive education in the field of gastronomy, cookery and agricultural engineering will be effective in developing various strategies in order to increase their preference for ancestor seeds in the process of organic product and local healthy food production and to increase the number of visitors to the region. The development of sustainable gastronomy and sustainable gastronomy tourism has multidimensional effects. Increased demand for local food and increased healthy and organic consumption indirectly increases interest in local raw materials and ancestral seeds, thus providing more employment opportunities for local people (Torres, 2002). Both the provision of local food products and the use of ancestral seeds in the production process of local food and organic food are important for the provision of local resources. In addition, the awareness of the students who receive education in the field about local food consumption reduces the carbon footprint as an environmental result by setting an example worldwide in terms of the services they will provide (Boniface, 2003; Sims, 2009). Raising a generation that is sensitive to socio-environmental issues will be able to promote actions that support local and local products, support family farming, local and local production, strengthen the ties between rural and urban areas, and increase the use of ancestor seeds, contributing to the increase of the organic product production process (Niederle & Schubert, 2020; Pereira, 2019).

Sustainable Agriculture

Sustainable agriculture is an approach that aims to make more effective and efficient use of available biophysical and human resources. The main challenge to achieve this goal is to minimize the use of external inputs and optimize internal resource use. This ensures the effective use of available resources and minimizes dependency on external systems. This allows for continuous improvements to be sustained, supporting the conservation of natural resources while reducing the pressure of agriculture on the ecosystem (Maynard et al., 2020). Moreover, natural processes are increasingly replacing external inputs, contributing to reduced environmental impacts (Pretty et al., 1996).

The fact that policies to ensure food security support productivity in the agricultural sector offers a great opportunity for these countries to realize their economic development in a sustainable manner. In this context, the integration of agricultural policies and technological innovations is important to create a more equitable and efficient agricultural system. Therefore, sustainable agriculture means different things for different countries. While undeveloped countries are generally unable to implement sustainable agriculture practices due to inadequate education and economic conditions, developing countries adopt sustainable agriculture with the objectives of ensuring food security, preventing environmental problems, providing healthier living conditions and preventing negative situations in rural areas (Adenle et al., 2012; Balcı Akova and Tapan, 2022). In this context, each country needs to develop sustainable agriculture strategies in line with its specific needs and conditions (Mohanty, 2017). In these countries, efforts to reduce environmental pollution, create a clean environment and protect human health are at the forefront. Inadequate education and limited economic resources make it difficult to adopt sustainable agricultural models in these countries, which negatively affects the effectiveness of agriculture. On the other hand, in developed countries, sustainable agriculture is more concerned with environmental quality and the negative impacts of resources on human health (Gafsi et al., 2006). Integrating new agricultural technologies in these countries would be a critical step to optimize production processes, increase food security and ensure agricultural sustainability. For example, innovations in water management, soil improvement methods, crop protection technologies and sustainable fertilization practices have the potential to increase both the quantity and quality of production. Making agricultural practices sustainable is necessary both to improve food security and to support economic development (Crucefix, 1998).

Restaurants, which have a significant economic potential in the food sector, have a great importance in terms of sustainability in terms of various aspects of the food they serve. Factors such as the proportion of food used in restaurants, where these foods are sourced, under what conditions they are produced and how they are served are critical factors to be considered in the context of sustainability. Restaurants have the opportunity to reduce environmental impact and fulfill social responsibilities at every stage of the supply chain (Ilbery and Maye, 2005). For example, organic and seasonal produce sourced from local farmers not only provides a fresh and nutritious menu, but also demonstrates an environmentally responsible approach by reducing the carbon footprint of transportation. Furthermore, the sustainability of food production methods contributes to both protecting ecosystems and supporting agricultural biodiversity. Factors such as reducing food waste, recycling practices and energy efficiency are part of restaurants' sustainability efforts. The potential of policies developed to ensure food security to increase productivity in the agricultural sector is highly effective in helping countries achieve their sustainable development goals (Higgins et al., 2019; Kim and Hall, 2021).

Increasing productivity in agriculture is not only limited to increasing production, but also contributes to raising the incomes of individuals working in the agricultural sector and improving income distribution in a more equitable way. This situation necessitates the adoption of sustainable agricultural policies and new agricultural technologies to both increase agricultural employment and achieve high-yield agricultural production targets (Sims, 2009). Nature has a limited capacity to resist all kinds of external interventions and to regenerate itself against the damages it is exposed to. This limited regeneration capability further increases the importance of maintaining environmental balance. Therefore, protecting the environment and natural resources at every stage of the development process is one of the primary social responsibilities of people. The concept of sustainable development emphasizes that natural resources should be used responsibly (Daly, 2006). Human activities can lead to a range of impacts that threaten the balance of nature, resulting in reduced biodiversity, degradation of ecosystems and climate change (Bansal, 2005). Therefore, the principles of environmental sustainability should be taken into account when formulating and implementing development policies. Moreover, the conservation of natural resources is not only of environmental but also of economic and social importance. Rational use of natural resources is a critical step to meet the needs of future generations. In this context, developing environmentally sensitive policies, raising social awareness and supporting environmental protection efforts will help people fulfill their responsibilities in this regard. As a result, respecting the limited regenerative capacity of nature and taking care not to exceed these limits is essential for a sustainable future (Boz et al., 2013).

The Importance of Ancestral Seed and Soil in Gastronomy Education

Soil is considered an indispensable living space that is home to many living things. It generally sheds light on history by providing important data in terms of understanding the processes that living things and humanity have gone through. Gastronomy, which belongs to the field of social sciences, can explain some of the information on the history of human nutrition by utilizing the information obtained as a result of anthropological studies. In addition, data on the biological processes of soil is a field that should be indirectly associated with gastronomy science. It is seen that the field of gastronomy focuses more on food, cuisine, tourism and the search for new flavors. Therefore, it can be thought that there is no need for information about soil and ancestor seeds in gastronomy and cookery education. However, ensuring that the importance of the soil and the ancestral seed, which constitute the source of food, is sufficiently understood is seen as a major deficiency in terms of establishing a healthy relationship between sustainable food and sustainable culinary practices, which are perhaps among the most mentioned issues today. According to Cemaloğlu (2021), similarly, the basis of the mistakes carried out in the practices carried out in the field of food and environment stems from the lack

of understanding of the importance of soil and organic agriculture science. The fact that this subject is not included in general education curricula in our country is seen as the main reason why this deficiency is not eliminated.

Studies in which the concepts of cuisine and ancestor seeds are evaluated together with soil and blended in application kitchens have been important for a long time in other countries besides Turkey. Pehlivan and Yavaş (2022) state that such studies in sustainable gastronomy practices are given much more importance especially abroad and in this context, it is stated that in some universities, students in gastronomy education carry out studies intertwined with concepts such as agroecology and permaculture, which include methods for sustainable agricultural practices. As a result of the knowledge gained by students in these trainings, it is seen that they are offered the opportunity to experience organic agriculture and organic products by creating one-to-one hobby gardens in farms and various application areas. Sustainable gastronomy culinary practices have a very broad perspective in this respect. For this reason, it is foreseen that multifaceted steps should be taken. In European countries, it is possible to mention that it is possible to make edible landscape designs in urban areas to be used in case of a possible global warming and disaster, balcony and roof gardening, organic hobby gardening and permaculture parks are not approached as a new subject, and that such applications are more prone and widespread compared to Turkey. For example; in permaculture parks, it is seen that the people living around the park produce their own organic food and provide the opportunity to protect the soil and transfer it to future generations by increasing the amount of organic matter in the soil and climate change by obtaining compost. In school gardens with edible landscapes for school children in Leith, USA, it was emphasized that school gardens with low carbon emissions, healthy and organic food production, emphasizing the importance of biodiversity in sustainable food production, can be passed on to future generations through transfer to students. He also states that providing trainings in the garden environment (referring to plants, pollination and composting, etc.) can be realized more easily even in this age group compared to the classroom environment (dos Santos, 2020). It has been observed that edible plants found locally in Brazil - despite their high nutritional value - are not sufficiently utilized in the kitchen. It is aimed to include these plants in the national food and nutrition to protect the country's biodiversity, in the development of organic agriculture, and to increase adaptation and resilience to the climate crisis. In this context, the researchers published a list of edible natural plants belonging to that region. They contributed to the creation of books with recipes for gastronomic uses of these plants (Moura de Oliveira Beltrame, 2021). In Turkey, it is possible to mention that there are a small number of businesses, institutions, farms, etc. that implement sustainable gastronomy in a similar way in culinary practices. It is seen that some of the subjects such as composting, water harvesting, organic farming, organic farming, ancestor seed production practices, which are included in

the content of trainings such as agroecology, permaculture, ancestor seed, which are included in sustainable gastronomy trainings abroad, are tried to be given in Turkey through courses carried out with various certificates, some projects in partnership with associations and universities, and some of the trainings organized by municipalities. In this regard, it is possible to mention that the aspect reflected in the institutions providing education at undergraduate and graduate level is almost non-existent. The situation of sustainable gastronomy education; When the university course contents are examined, it is seen that the courses such as sustainable tourism, sustainable gastronomy, ecogastronomy, local dishes are especially focused on tourism, and that their counterparts abroad are compared with school gardens and greenhouses, farm partners (integrated into sustainable systems, extensive animal husbandry, beekeeping and agroecology in agricultural production areas) and joint training activities with artisan food enterprises. However, some nature and climate friendly cooperation texts such as the "Cooperation Protocol on Creating a Sustainable and Climate Friendly Campus" have been signed with some universities. Thus, it is aimed to implement zero waste, practices to prevent food waste, composting, collection and use of roof and rainwater, use of ancestor seeds, and energy-saving practices in pilot universities (YÖK, 2024). When the websites of the universities selected for sustainable campus practices are examined, it is seen that their campuses include practices such as parking areas with herbal production, park design with natural materials, and waste separation. It is thought that Özyeğin University Gastronomy and Culinary Arts department is implementing a campus orchard in its education program and in this context, permaculture trainings, food production, etc. should be included in the curriculum (YÖK, 2024). With the TUBITAK 4004 project "I Learn in Nature with Permaculture Philosophy for a Sustainable World", Yozgat Bozok University became a project partner to provide training for teachers (TUBITAK, 2024). Within the scope of the "SDU Green, Livable and Sustainable Campus Project" (2024), which is being implemented under the coordination of Süleyman Demirel University Water Institute, studies on zero waste and water saving are being carried out (TÜBİTAK, 2024). It is thought that these similar studies will contribute to sustainability. It is also encouraging in terms of the spread of sustainable gastronomy studies.

Agricultural education in our country should be carried out through a curriculum in which monoculture agricultural methods are generally taught. Monoculture agriculture, which is traditionally practiced, is seen as a major obstacle to ecological sustainability. For this reason, changes should be made in this regard in order to realize sustainable agricultural methods. Kanbak (2018) states that monoculture agriculture is the most widely practiced agricultural production method in the industry. He emphasizes that thanks to this method, it is possible to grow a single product in the production area. He states that in the realization of practices for the standardization of agriculture and market control, no plants and animals will be able to live except for the products that will be produced first, and the importance of agricultural lands will

increase. Although sustainable food is thought to attract attention depending on the level of awareness of the society on issues such as climate crisis, water crisis, environmental pollution, ancestor seed and destruction of ecology, these issues are seen as a major problem that can deeply affect all humanity. For this reason, it is urgently necessary to support education and practices for our country and to accelerate ancestral seed practices. In order for these to be done, it is of great importance for the faculty members who teach gastronomy and culinary arts, cookery and agricultural engineering to fulfill their responsibilities, especially in universities, to review the trainings on these issues and include their applications in the curriculum, to set an example to the public with pilot application areas, and to carry out studies on this subject together with local and traditional methods.

Methodology

Ancestral seeds are considered one of the basic building blocks of national security. When the powers that aim to control humanity by disrupting the genetic structure of seeds realized the disruptions in their own lands, they set Mesopotamia as a focal point. The saying "The greatest service that can be rendered to any country is to provide its culture with a useful plant seed" supports this belief (Saracoglu, 2022). As it can be understood from this, ancestral seeds play a leading role in protecting local and national value and are the center of attention of people today. The aim of the research is to investigate ancestral seeds, to provide information about these seeds and to present a written source on this subject to the literature. The research was designed qualitatively. Document analysis technique was used by utilizing secondary sources. This analysis technique is used to meticulously analyze the content of written sources (Wach, 2013). Within the scope of the analysis, all written and electronic sources are systematically analyzed. As in other methods, document analysis method can be used to create a meaning, develop empirical information and make sense of the researched topic (Corbin & Strauss, 2008). In order to achieve the aim, the relevant literature was reviewed and the most frequently mentioned ancestral seeds in the sources were compiled. These seeds were identified as Yellow Wheat, Black Melon, Çanakkale pepper, Ottoman Strawberry, Cranberry and Garlic. These seeds constitute the sample of the research. Research was conducted as ancestor seeds and it was seen that these were the most common seeds. For this reason, the research was limited to these seeds. Information about the seeds was collected between 10.08.2024-10.10.2024. In order to achieve the aim of the research, the following parameters were set out:

- ❖ What are the so-called ancestral seeds?
- ❖ What is the chronological order of ancestral seeds?
- ❖ What is the sustainability status of ancestral seeds today?

In line with the data obtained, survey technique, one of the quantitative research methods, was used in the research. The population of the research consists of faculty members and

associate, undergraduate and graduate students of the Department of Gastronomy and Culinary Arts, Department of Cookery and Department of Agricultural Engineering in Turkey and abroad.

The chronological order of ancestor seeds is given in Table 1. When the table is examined, it is seen that the first product is Yellow Wheat.

Table 1. Chronological Order of Ancestor Seeds

Ancestor Seeds	Year	Motherland
Yellow Wheat	Neolithic Age	Mesopotamia
Black Melon	3000 B.C.E.	China
Garlic (Taşköprü Garlic)	2600-2100 BCE	Central Asia
Ottoman Strawberry	23-79 AD	France
Canakkale Pepper	-	Americas
Cranberry	-	West Asia

Results

Ancestral seeds play a critical role in preserving local and traditional agricultural varieties and maintaining sustainable agricultural practices. Through natural selection over generations, these seeds have adapted to environmental conditions, acquired disease resistance and become compatible with local ecosystems. The use of ancestral seeds preserves genetic diversity and provides alternative solutions to the threats faced by modern agriculture, such as pests and diseases caused by uniform agriculture. In addition, crops produced with ancestral seeds are often more nutritious and flavorful. As part of cultural heritage, they also support the agricultural independence of local communities and contribute to a healthy food system for future generations. In this part of the study, ancestral seeds will be discussed one by one and detailed information about each product will be given.

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Strategies On Accelerating Sustainable Development Goals (SDG) Management through AI Integration

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Abstract:

The integration of artificial intelligence (AI) into the management of Sustainable Development Goals (SDGs) presents a transformative opportunity to address pressing global challenges. This paper explores the multifaceted applicability of AI in advancing the 17 SDGs, highlighting its potential to enhance efficiency, drive innovation, and foster inclusive growth across various sectors. Through a comprehensive review of existing literature and case studies, we identify that AI can enable progress on 134 targets (approximately 79% of all SDG targets), while also recognizing the risks associated with its implementation, including ethical concerns and potential biases. We discuss specific applications of AI in critical areas such as healthcare, agriculture, climate action, and education, illustrating how AI technologies can facilitate data-driven decision-making and resource optimization. More precisely, it is herein attempted, how AI can be applied to SDG targets and goals as well as a general flowchart of its applications. More emphasis is paid to AI and SDG goals and targets relevance Additionally, we introduce an emphasis about the necessity for robust regulatory frameworks and collaborative efforts among stakeholders to ensure that AI deployment aligns with sustainable practices and equitable outcomes. Ultimately, this paper aims to provide some insights into harnessing AI as a catalyst for achieving the SDGs while addressing the challenges that accompany its rapid advancement.

Introduction

The 2030 Agenda for Sustainable Development, with its 17 SDGs, provides a comprehensive framework for global progress towards a more equitable and sustainable future. However, achieving these goals requires overcoming significant challenges, including scarcity of resources, complex interdependencies, and the need for accurate data and robust decision-making processes. AI, with its ability to analyze vast datasets, identify patterns, and generate insights, offers a powerful tool for addressing these challenges and accelerating progress towards the SDGs. [1-7]. This paper attempts to present systematically, but at a preliminary stage, the major issues about AI and SDG goals.

AI Applicability Analytics for SDG Management

AI can be applied across various stages of SDG management, including data collection, analysis, monitoring, and evaluation. Table 1 illustrates the key areas where AI can contribute to SDG implementation. [1-7]

Table 1: Potential AI integration with SDG Management

SDG Goal	Target	AI Application	Impact
No Poverty (SDG 1)	1.1	Poverty Mapping	Identifies poverty hotspots using satellite imagery
	1.2	Financial Inclusion Platforms	Provides access to banking services for underserved populations
	1.3	Social Protection Optimization	Ensures social protection programs reach the most vulnerable
	1.4	Data Analysis for Basic Services	Improves access to basic services and property rights
Zero Hunger (SDG 2)	2.1	Food Distribution Optimization	Reduces waste and ensures food reaches those in need

SDG Goal	Target	AI Application	Impact
	2.2	Nutritional Program Monitoring	Improves effectiveness of nutritional programs
	2.3	Precision Agriculture	Increases crop yields and improves food security
	2.4	Sustainable Agricultural Practices	Predicts weather patterns and pest outbreaks
Good Health and Well-being (SDG 3)	3.1	Early Diagnosis and Treatment	Reduces maternal mortality
	3.2	Child Health Improvement	Enhances vaccination tracking and disease prevention
	3.3	Disease Prediction and Control	Tracks and predicts outbreaks of infectious diseases
	3.4	Mental Health Support	Provides personalized care and early intervention
Quality Education (SDG 4)	4.1	Personalized Learning Platforms	Improves educational outcomes

SDG Goal	Target	AI Application	Impact
	4.2	Early Childhood Education Tools	Enhances interactive learning
	4.3	Access to Technical Education	Provides quality technical and vocational education
	4.4	Employment and Entrepreneurship Skills	Develops skills through tailored training programs
Gender Equality (SDG 5)	5.1	Gender Disparity Analysis	Identifies and addresses gender disparities
	5.2	Combating Gender-based Violence	Analyzes social media to identify and combat violence
	5.3	Ending Harmful Practices	Supports initiatives to end child marriage and FGM
	5.5	Promoting Women's Leadership	Supports initiatives for women's participation in leadership
Clean Water and Sanitation (SDG 6)	6.1	Water Distribution Optimization	Ensures access to clean water

SDG Goal	Target	AI Application	Impact
	6.2	Sanitation Management	Improves predictive maintenance of sanitation facilities
	6.3	Water Quality Monitoring	Detects pollutants and ensures safe water
	6.4	Water-use Efficiency	Enhances efficiency in agriculture and industry
Affordable and Clean Energy (SDG 7)	7.1	Energy Grid Optimization	Provides reliable and affordable energy
	7.2	Renewable Energy Efficiency	Enhances efficiency of renewable energy sources
	7.3	Energy Efficiency Improvements	Improves efficiency in buildings and industries
	7.a	Energy Technology R&D	Supports research and development in energy technologies

SDG Goal	Target	AI Application	Impact
Decent Work and Economic Growth (SDG 8)	8.1	Economic Growth through Innovation	Drives economic growth
	8.2	Industrial Productivity	Drives innovation and productivity
	8.3	Supporting Entrepreneurship	Provides access to market data and trends
	8.5	Job Matching	Matches job seekers with employment opportunities
Industry, Innovation, and Infrastructure (SDG 9)	9.1	Infrastructure Development	Optimizes development and maintenance
	9.2	Sustainable Industrialization	Supports efficient resource use
	9.3	Financial Services Access	Improves access for SMEs
	9.5	R&D Support	Drives innovation through research and development

SDG Goal	Target	AI Application	Impact
Reduced Inequality (SDG 10)	10.1	Addressing Income Inequalities	Analyzes economic data
	10.2	Social and Economic Inequality	Identifies and addresses inequalities
	10.3	Promoting Equal Opportunities	Ensures equal opportunities and reduces discrimination
	10.4	Social and Economic Inclusion	Supports inclusive policies
Sustainable Cities and Communities (SDG 11)	11.1	Urban Planning	Ensures access to affordable housing
	11.2	Public Transportation Optimization	Improves sustainability of transportation systems
	11.3	Participatory Urban Planning	Supports inclusive urban management
	11.6	Urban Pollution Management	Monitors and manages pollution

SDG Goal	Target	AI Application	Impact
Responsible Consumption and Production (SDG 12)	12.2	Resource Efficiency	Enhances efficiency in production processes
	12.3	Reducing Food Waste	Improves supply chain management
	12.4	Hazardous Waste Management	Monitors and manages waste
	12.5	Promoting Recycling	Supports waste reduction initiatives
Climate Action (SDG 13)	13.1	Climate Change Mitigation	Predicts and mitigates impacts
	13.2	Climate Policy Integration	Supports policy and planning
	13.3	Climate Education	Enhances awareness and education
	13.a	Climate Finance	Supports finance initiatives
Life Below Water (SDG 14)	14.1	Marine Pollution Monitoring	Reduces marine pollution

SDG Goal	Target	AI Application	Impact
	14.2	Marine Ecosystem Management	Supports sustainable management
	14.4	Sustainable Fishing	Supports sustainable practices
	14.5	Marine Biodiversity Protection	Protects marine biodiversity
Life on Land (SDG 15)	15.1	Ecosystem Monitoring	Protects terrestrial ecosystems
	15.2	Reforestation Efforts	Supports reforestation and afforestation
	15.5	Combating Deforestation	Reduces biodiversity loss
	15.9	Biodiversity Integration	Integrates values into planning
Peace, Justice, and **Strong Institutions (SDG 16)**	16.1	Conflict Prediction	Prevents conflicts
	16.3	Access to Justice	Supports legal analytics and case management

SDG Goal	Target	AI Application	Impact
	16.6	Transparency and Accountability	Promotes institutional transparency
	16.10	Human Rights Monitoring	Analyzes human rights abuses
Partnerships for the Goals (SDG 17)	17.6	Global Partnerships	Facilitates knowledge sharing
	17.8	Technology for Development	Enhances technology use
	17.18	Data Collection and Analysis	Improves decision-making
	17.19	Capacity Building	Supports initiatives in developing countries

This table provides a comprehensive overview of how AI can be applied to each SDG target, highlighting specific applications and their impacts [1-7].

To illustrate how AI applications can enhance the Sustainable Development Goals (SDGs) through various stages such as data collection, analysis, monitoring, and evaluation, a flowchart can be structured. A flowchart depicting AI applications in SDG stages, including data collection, analysis, monitoring, & evaluation, with examples like image recognition, natural language processing, predictive modeling, etc. could be defined as follows [1-7]:

A flowchart on how AI can be applied to meet SDG targets

1. Data Collection

- Image Recognition: Utilizes computer vision to gather data from satellite imagery for monitoring deforestation or urban development.
- Natural Language Processing (NLP): Analyzes social media and survey responses to assess public sentiment on health or education issues.
- IoT Sensors: Collects real-time data on environmental conditions, such as air quality and water levels.

2. Data Analysis

- Predictive Modeling: Employs machine learning algorithms to forecast agricultural yields or disease outbreaks based on historical data.
- Big Data Analytics: Integrates diverse datasets (e.g., demographic, economic) to identify trends and correlations relevant to poverty alleviation or health outcomes.
- Sentiment Analysis: Uses NLP to derive insights from public opinions on policies related to gender equality or climate action.

3. Monitoring

- Real-Time Dashboards: AI systems create dashboards that visualize key indicators for SDG progress, enabling stakeholders to track performance dynamically.
- Anomaly Detection: Machine learning models identify irregular patterns in data, such as sudden spikes in pollution levels or resource consumption.
- Geospatial Analysis: Combines satellite data with AI to monitor changes in land use and biodiversity over time.

4. Evaluation

- Impact Assessment Models: AI evaluates the effectiveness of interventions by comparing pre- and post-intervention data across various SDGs.
- Scenario Simulation: Predictive analytics simulate different policy scenarios to evaluate potential outcomes on social, economic, and environmental targets.
- Feedback Loops: AI systems analyze feedback from stakeholders to refine programs and policies aimed at achieving the SDGs.

Examples of AI Techniques Across the above presented Flowchart Stages

Stage	AI Technique	Application Example and relevant case studies
Data Collection	Image Recognition	Monitoring deforestation via satellite imagery (A notable case study for monitoring deforestation via satellite imagery is the Seringueira REDD+ Project in Brazil. This project utilizes satellite data from Planet NICFI, Sentinel-1, and Sentinel-2 to effectively monitor forest loss at a high spatial resolution of 4.7 meters. Overview of the Seringueira REDD+ Project Objective: The project aims to promote high-integrity nature-based carbon projects while ensuring transparency through reliable satellite monitoring. Collaboration: Nadar, Moss, and explorer.land collaborated to provide accurate monitoring and reporting of deforestation and aboveground biomass (AGB) changes in the Brazilian Amazon. https://www.nadar.earth/case-studies/seringueira)
Data Collection	NLP	Analyzing social media for public health sentiments (An example project is Analyzing Social Media Messaging on Masks and Vaccines: A Case Study on Misinformation During the COVID-19 Pandemic [8])
Data Analysis	Predictive Modeling	Forecasting crop yields based on weather patterns (An example case study is Crop Yield Prediction Using Machine Learning Models: Case of Irish Potato and Maize [9])
Data Analysis	Big Data Analytics	Identifying trends in economic inequality (An example case study is Trends in Income Inequality: Evidence from Developing and Developed Countries [10,11])
Monitoring	Real-Time Dashboards	Visualizing progress on SDG indicators (An example case study is the event Visualizing Progress: Data Insights from the Atlas of Sustainable Development Goals https://live.worldbank.org/en/event/2023/visualizing-progress-data-insights-atlas-sustainable-development-goals)
Monitoring	Anomaly Detection	Detecting pollution spikes in urban areas (An example case study is Air-pollution prediction in smart city, deep learning approach [12])

Stage	AI Technique	Application Example and relevant case studies
Evaluation	Impact Assessment Models	Assessing the effectiveness of health interventions (An example overview of case studies and literature is The effectiveness of interventions to change six health behaviours: a review of reviews [13])
Evaluation	Scenario Simulation	Evaluating potential impacts of renewable energy policies (An example case study project is Tracking the Impacts of Innovation: Offshore wind as a case study This report is an initial output of two projects focused on tracking innovation impacts: the Innovation Impacts Dashboard (IID) project and the Tracking Energy Innovation Impacts Framework (TEIIF) project. ISBN: 978-92-9260-347-2 , https://www.irena.org/publications/2021/Jun/Impact-of-Innovation-Offshore-wind-case-study)

This flowchart demonstrates the multifaceted role of AI in supporting the SDGs through systematic data handling and analysis processes. By leveraging these technologies, stakeholders can enhance their decision-making capabilities and improve the overall effectiveness of initiatives aimed at achieving sustainable development.

Data Collection and Analysis.

- Remote Sensing and Image Recognition: AI-powered image recognition can analyze satellite imagery to monitor deforestation, track agricultural practices, and assess urban sprawl, contributing to SDG 13 (Climate Action), SDG 11 (Sustainable Cities and Communities), and SDG 15 (Life on Land).
- Natural Language Processing (NLP): NLP can analyze large volumes of text data from social media, news articles, and reports to identify public opinion, understand community needs, and monitor progress on SDG indicators. This can be particularly relevant for SDG 1 (No Poverty), SDG 3 (Good Health and Well-being), and SDG 16 (Peace, Justice, and Strong Institutions).
- Sensor Data and IoT: AI can process data from IoT devices deployed in various environments to monitor air and water quality, energy consumption, and traffic patterns, providing insights for SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), and SDG 11 (Sustainable Cities and Communities).

Monitoring and Evaluation.

- Predictive Modeling: AI can leverage historical data and current trends to forecast future outcomes related to SDG indicators, allowing for proactive interventions and resource allocation. For instance, predicting food insecurity (SDG 2: Zero Hunger) or water scarcity (SDG 6: Clean Water and Sanitation) can empower early action.

- Anomaly Detection: AI algorithms can identify unusual patterns and deviations from expected trends in various datasets, flagging potential risks and enabling swift responses. This is crucial for monitoring SDG 10 (Reduced Inequalities) and SDG 17 (Partnerships for the Goals).

- Impact Assessment: AI can help assess the impact of interventions and policies on different SDG targets, facilitating evidence-based decision-making and optimizing resource utilization. This can be relevant across all SDGs.

Examples of AI Application in SDG Management

The following Table 2 presents a sample of examples of AI applicability and correlation with SDG targets

Table 2: AI Applications for Specific SDGs

SDG	AI Application	Example	Expected Impact
SDG 1: No Poverty	Predictive Modeling	Forecasting poverty rates based on socioeconomic data and historical trends	Targeted interventions for poverty alleviation
SDG 7: Affordable and Clean Energy	Optimization Algorithms	Optimizing energy grid management for renewable energy integration	Reduced energy costs and carbon emissions
SDG 13: Climate Action	Climate Modeling	Developing predictive models for climate change impacts	Better preparedness for extreme weather events and mitigation strategies
SDG 11: Sustainable Cities and Communities	Smart City Infrastructure	Utilizing AI for traffic management, waste collection, and resource optimization	Improved urban planning and reduced environmental footprint

AI applicability for SDG targets

AI has the potential to significantly contribute to achieving 134 of the 169 Sustainable Development Goals (SDG) targets, which is approximately 79% of all targets [1-7]. Below is a detailed overview of how AI can enable progress on each of these targets:

1. No Poverty (SDG 1)

- Target 1.1: AI can help identify and target poverty hotspots using satellite imagery and data analytics.

- Target 1.2: AI-driven financial inclusion platforms can provide access to banking and financial services for underserved populations.

- Target 1.3: AI can optimize social protection programs to ensure they reach the most vulnerable.

- Target 1.4: AI can analyze data to improve access to basic services and property rights.

2. Zero Hunger (SDG 2)

- Target 2.1: AI can optimize food distribution networks to reduce waste and ensure food reaches those in need.

- Target 2.2: AI can help monitor and improve nutritional programs.

- Target 2.3: AI-powered precision agriculture can increase crop yields and improve food security.

- Target 2.4: AI can support sustainable agricultural practices by predicting weather patterns and pest outbreaks.

3. Good Health and Well-being (SDG 3)

- Target 3.1: AI can assist in early diagnosis and treatment of diseases, reducing maternal mortality.

- Target 3.2: AI can improve child health through better vaccination tracking and disease prevention.

- Target 3.3: AI can help track and predict outbreaks of infectious diseases, aiding in their control and prevention.

- Target 3.4: AI can support mental health initiatives by providing personalized care and early intervention.

4. Quality Education (SDG 4)

- Target 4.1: AI-driven personalized learning platforms can improve educational outcomes for students.

- Target 4.2: AI can enhance early childhood education through interactive learning tools.

- Target 4.3: AI can provide access to quality technical and vocational education.

- Target 4.4: AI can help develop skills for employment and entrepreneurship through tailored training programs.

5. Gender Equality (SDG 5)

- Target 5.1: AI can analyze data to identify and address gender disparities.
- Target 5.2: AI can analyze social media and other data to identify and combat gender-based violence.
- Target 5.3: AI can support initiatives to end harmful practices such as child marriage and female genital mutilation.
- Target 5.5: AI can support initiatives that promote women's participation in leadership and decision-making roles.

6. Clean Water and Sanitation (SDG 6)

- Target 6.1: AI can optimize water distribution systems to ensure access to clean water.
- Target 6.2: AI can improve sanitation management through predictive maintenance of facilities.
- Target 6.3: AI can monitor water quality and detect pollutants, ensuring safe water for all.
- Target 6.4: AI can enhance water-use efficiency in agriculture and industry.

7. Affordable and Clean Energy (SDG 7)

- Target 7.1: AI can optimize energy grids to provide reliable and affordable energy.
- Target 7.2: AI can enhance the efficiency of renewable energy sources, promoting clean energy.
- Target 7.3: AI can improve energy efficiency in buildings and industries.
- Target 7.a: AI can support research and development in energy technologies.

8. Decent Work and Economic Growth (SDG 8)

- Target 8.1: AI can drive economic growth through innovation and productivity improvements.
- Target 8.2: AI can drive innovation and productivity in various industries, fostering economic growth.
- Target 8.3: AI can support entrepreneurship and small businesses through access to market data and trends.
- Target 8.5: AI can help match job seekers with employment opportunities, promoting full and productive employment.

9. Industry, Innovation, and Infrastructure (SDG 9)

- Target 9.1: AI can optimize infrastructure development and maintenance.
- Target 9.2: AI can support sustainable industrialization through efficient resource use.
- Target 9.3: AI can improve access to financial services for small and medium-sized enterprises.
- Target 9.5: AI can support research and development, driving innovation.

10. Reduced Inequality (SDG 10)

- Target 10.1: AI can analyze economic data to identify and address income inequalities.
- Target 10.2: AI can identify and address social and economic inequalities.
- Target 10.3: AI can help ensure equal opportunities and reduce discriminatory practices.
- Target 10.4: AI can support policies that promote social and economic inclusion.

11. Sustainable Cities and Communities (SDG 11)

- Target 11.1: AI can improve urban planning to ensure access to affordable housing.
- Target 11.2: AI can optimize public transportation systems, making cities more sustainable.
- Target 11.3: AI can support participatory urban planning and management.
- Target 11.6: AI can monitor and manage urban pollution, improving air quality.

12. Responsible Consumption and Production (SDG 12)

- Target 12.2: AI can enhance resource efficiency in production processes.
- Target 12.3: AI can reduce food waste through better supply chain management.
- Target 12.4: AI can monitor and manage hazardous waste.
- Target 12.5: AI can promote recycling and waste reduction initiatives.

13. Climate Action (SDG 13)

- Target 13.1: AI can predict and mitigate the impacts of climate change.
- Target 13.2: AI can support the integration of climate change measures into policies and planning.
- Target 13.3: AI can enhance climate education and awareness.
- Target 13.a: AI can support climate finance initiatives.

14. Life Below Water (SDG 14)

- Target 14.1: AI can monitor and reduce marine pollution.
- Target 14.2: AI can support the sustainable management of marine and coastal ecosystems.
- Target 14.4: AI can support sustainable fishing practices.
- Target 14.5: AI can help protect marine biodiversity.

15. Life on Land (SDG 15)

- Target 15.1: AI can monitor and protect terrestrial ecosystems.
- Target 15.2: AI can support reforestation and afforestation efforts.
- Target 15.5: AI can help combat deforestation and biodiversity loss.
- Target 15.9: AI can integrate ecosystem and biodiversity values into planning and development processes.

16. Peace, Justice, and Strong Institutions (SDG 16)

- Target 16.1: AI can help predict and prevent conflicts.

- Target 16.3: AI can support access to justice through legal analytics and case management systems.
- Target 16.6: AI can promote transparency and accountability in institutions.
- Target 16.10: AI can protect fundamental freedoms by monitoring and analyzing human rights abuses.

17. Partnerships for the Goals (SDG 17)

- Target 17.6: AI can facilitate global partnerships and knowledge sharing.
- Target 17.8: AI can enhance the use of technology for development.
- Target 17.18: AI can improve data collection and analysis for better decision-making.
- Target 17.19: AI can support capacity-building initiatives in developing countries.

These examples illustrate the diverse ways AI can contribute to achieving the SDG targets. The potential applications are vast and varied, offering innovative solutions to some of the world's most pressing challenges (https://www.nature.com/articles/s41467-019-14108-y.pdf?pdf=button%20sticky)**.**

Challenges and Considerations

While AI presents immense potential for SDG management, its implementation faces several challenges:

- Data Availability and Quality: Reliable and accessible data are crucial for AI algorithms to function effectively. Many developing countries struggle with data scarcity and quality issues.
- Algorithmic Bias and Fairness: AI models can inherit biases present in the data they are trained on, potentially leading to unfair or discriminatory outcomes. This needs careful consideration, especially when dealing with sensitive issues like poverty or healthcare.
- Ethical Implications: Concerns related to data privacy, transparency, and accountability must be addressed when deploying AI for SDG management.
- Capacity Building: Developing local expertise and capacity to implement and maintain AI solutions is crucial for long-term sustainability.

Future Directions

The future of AI in SDG management lies in enhancing its capabilities and addressing the identified challenges.

- Developing Robust Data Infrastructure: Investing in data collection, storage, and management systems is vital for ensuring high-quality data for AI applications.
- Promoting Ethical AI Development: Establishing clear guidelines and standards for ethical AI development and deployment is crucial to mitigate potential biases and risks.

- Fostering Collaboration and Knowledge Sharing: Encouraging collaboration between researchers, policymakers, and practitioners will facilitate knowledge sharing and accelerate the development of effective AI solutions for SDGs.

Conclusions and future prospects of this study

AI holds immense potential to revolutionize SDG management by enabling data-driven decision-making, improving monitoring and evaluation processes, and driving innovation for achieving a sustainable future. By addressing the associated challenges and fostering responsible AI development, we can leverage this transformative technology to accelerate progress towards the SDGs and build a more equitable and sustainable world for all. This study has paid attention and effort at preliminary stage, however, to comprehensively outline the major issues of the applicability of AI towards reaching the SDG goals and targets. The author, however, will present a more detailed analysis in the near future.

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Education and E-Learning

Meta Discourse ands Appraisal Analysis of Media Perspective on Thai Government` Performance towards Thai Education

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Abstract

This study aims to examine the distribution of Syntactic Patterns and Pragmatic Functions based on the Interactional Metadiscoursal and Appraisal theory through the journalistic views of the Thai and Native English Journalists. The data was drawn to reveal the distribution of Syntactic Patterns and Pragmatic Functions from the opinion section of the popular English newspaper on the Thai Government's Performance in 10 English written Thai Journalists and 10 English native Journalists, making 20 pieces. The similarities and different between sub-types of judgment resources were additionally explored to display the writers' judgment as evaluative assessments through the lens of media discourse. Both quantitative and qualitative methods were carried out in this study to display the in-depth findings. Regarding the judgments- polarity and attitudinal markers based the statistical results of this study, it revealed that there are different Syntactic Patterns and Pragmatic Functions employed by different writing norms and conventions as well as their communicative language communities. Thus, the attitudinal judgment based on Interactional Metadiscoursal and Appraisal markers are strongly voiced through the lens of journalists in the media discourse interactions.

Keywords: Metadiscourse, Appraisal, Media Perspective, Thai Government's Performance

Introduction

From the public great concern on the current reformation of Thai education, it is clear that the journalistic views provided in the opinion section play a crucial role in judging and disseminating their arguments against the government's poor management publicly. Based on media discourse, the journalistic views are regarded as a fair response to the facts of the public act. Their opinion of the graving situation is presented to the readers in conveying the content having certain discoursal implicitness which is worth carrying out the multifaceted appraisal analysis. The appraisal developed by White and Martin (2003) convinces the writers' language use in explaining writers' attitudinal judgement, emotional differentiation; and individual differences in attitudinal response; and the appropriateness of how to create reactions to the situations. In a nutshell, the appraisal represents a discourse semantic function which can

help the writers to make use of stances and construe their interpersonal meaning expressed in the target texts.

With regard to the studies in Appraisal Theory, a lot of research are conducted in various discourses, such as literature, academic written texts and media speeches (e.g. Asher, et al., 2009; Bednarek, 2006; Caro, 2014; Gales, 2011; Putri, 2020). These researches greatly explored evaluative meanings of attitudinal languages in a particular context. Nonetheless, there are still scant studies of appraisal analysis conducted on the criticism of the Thai government' performance in Thai research context. With the significance of the selection of linguistic use within a particular text type, the critical analysis with linguistic features is worth exploring to understand online media perspectives. In this sense, we can see how the opinion section reflects its journalistic perspective towards the governments' political management of such severer situations in terms of language analysis.

This study is therefore an attempt to explore how the media discourse based on appraisal theory is conducted through on the journalistic views towards the Thai government's performance to the current reformation of Thai education. The data drawn was selected from the opinion section of the popular English newspaper in Thailand (Bangkok Post). The aim is to grasp the nature of linguistic perspectives and analyze how opinion section utilizes the attitudinal language to display the writers' judgment as evaluative assessments through the lens of media discourse with the following research question:

RQ 1. What are the salient appraisal features identified in each judgment category found in the opinion section?
RQ 2. How do the appraisal features found display perspectives of media towards Thai government in dealing the current reformation of Thai education?

Method and Theoretical Framework
This study gives a great contribution in analyzing the target texts through the application of appraisal framework. This is because, the appraisal theory is considered the most appropriate framework in assisting the researcher to uncover and assess how the journalists evaluated the governments' performance and how they express the kinds of attitudes and how they project the strength of the feelings involved in the opinion sections of the News.

Within the appraisal system, the judgement category was specifically applied to the analysis of a sample of opinion sections of this study listed in the following framework (Martin & White, 2003; White, 2015).

Judgement	Description	Examples
Normality and Abnormality	How unusual of the appraised in positive aspects	Nor: lucky, normal, cool, fortunate Abnor: unlucky, peculiar, obscure, unpredictable
Capacity and Incapacity	The appraise's ability and limitation	Cap: powerful, healthy, clever, fit, adult, balanced Incap: slow, stupid, thick, sick, weak, unsuccessful
Tenacity and Untenacity	The appraiser's bravery, patience and dependability	Ten: brave, cautious, careful Unten: impatient, cowardly, rash, inconstant
Veracity and Inveracity	The appraiser's honesty and good manner of speaking	Ver: honest, credible, frank Inveracity: dishonest, deceitful, blunt
Propriety and Impropriety	The appraiser's good manner and morality	Prop: good, moral, fair, ethical Improp: bad, unfair, vain, immoral

Based on the framework, judgement can be divided into two main categories including social esteem referring to praising a person, in contrast, social sanction indicating to condemning a person. The judgement types are always used to study how the speaker or author expresses his subjective attitude in words in relation to the contextualized extension (Martin & White, 2003).

Data Collection and Preparation

The corpus data in this study were compiled from the online version of Bangkok Post of the current reformation of Thai education issue, during January 2024 – July 2024. The online news were selected due to the research methodological benefits and for reaching a wider and keener audience than in any other modes of media. The online version of Bangkok Post was specifically selected since it is the English-language oldest and longest daily newspaper published in Thailand. The online version of Bangkok Post can be used as the reliable representative of media discourse which portrays the critical interactions of journalists that display through a broadcast platform.

The corpus consist of 20 Editorial sections of the criticism Thai government manipulation by different authors. They were transcribed in Microsoft Word. Initial goal of corpus size contains 15,336 words. In addition, full texts are generally preferable because important information can be found anywhere in a text. Since this study was conducted with small-scale corpus, the

representativeness of the findings will be extracted with the saturation, particularly when investigating high frequency items in order to answer the research questions (McEnery, et al, 2006). Therefore, the lexical features of judgement types and distinctive lexical items will be focused in the target context of this study.

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**How Can We Advance Cognitive Skills for Sustainable Careers?
Integrating the Inner Development Goals (IDG) Framework
into Business School Classrooms**

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Abstract

This theoretical manuscript aims to explore the role that dimension two, 'Thinking-Cognitive Skills' of the Inner Development Goals (IDG) framework, can play in empowering sustainable careers and sustainable development. We begin by setting the scene before introducing the theoretical framework, which combines the IDG framework and Sustainable Career Ecosystems Theory (SCET). Our attention then turns to systematically considering each of the components of dimension two of the IDG framework. These include (a)critical thinking, (b) complexity awareness, (c) perspective skills, (d) sense-making, and (e) long-term orientation and visioning. The theoretical contribution comes from integrating the IDG framework and SCET. Practical implications come from offering eight pragmatic recommendations to empower students in the context of higher education to prepare for sustainable careers and sustainable development: (i) curriculum design, (ii) interdisciplinary approach, (iii) experiential learning, (iv) faculty development, (v) assessment and evaluation, (vi) campus culture, (vii) collaboration and external partners, and (viii) research and innovation. Limitations and a future research agenda are also provided.

Keywords: cognitive skills, Inner Development Goals (IDG), higher education, sustainable careers, employability, strategic thinking.

Introduction

In a world driven by rapid change, cognitive skills are increasingly seen as vital for career sustainability. They are integral to navigating the complexities of modern workplaces, as highlighted by the New Psychological Contract (NPC), which emphasizes agility and employability (Baruch & Rousseau, 2019; Donald, 2023). These skills are central to the Inner Development Goals (IDG) framework, which is linked to the United Nations Sustainable Development Goals (SDGs), particularly SDG4, focusing on quality education and lifelong learning opportunities (United Nations, 2015).

Theoretical Framework: IDG and SCET

The IDG framework works in conjunction with the Sustainable Career Ecosystems Theory (SCET). While SCET emphasizes agility in career development, IDGs focus on inner qualities such as thinking and cognitive skills. Together, these frameworks form a comprehensive approach to preparing students for sustainable careers, particularly through higher education, where skills like critical thinking, perspective-taking, and sense-making are taught and honed (Donald et al., 2023; Jakubik, 2020; Shtaltovna & Muzzu, 2021a).

Dimension Two of the IDG Framework: Thinking-Cognitive Skills

The IDG framework comprises five dimensions, and this article specifically focuses on Dimension Two: 'Thinking-Cognitive Skills'. These include:

1. Critical Thinking: The ability to analyze information and make reasoned judgments (Sala et al., 2020; King & Kitchener, 1994; Kahneman, 2011).
2. Complexity Awareness: Understanding and navigating complex systems and their interdependencies (Ackoff, 1979; Juarrero, 1999; Juarrero, 2023; Meadows, 2008, Snowden, 2009).
3. Perspective Skills: Appreciating diverse viewpoints and integrating different perspectives (Dawson, 2020; Vygotsky, 1978).
4. Sense-Making: Structuring and interpreting experiences to guide understanding and action (Weick, 2005; Urquhart & Snowden, 2024; Hübl, 2023).
5. Long-Term Orientation and Visioning: Envisioning the future and formulating sustainable plans (Bennett & Lemoine, 2014; Sylvester & Donald, 2023).

Each of these components is crucial for fostering sustainable career practices in students, enabling them to navigate the increasingly complex world of work effectively.

Integrating IDG Cognitive Skills in Higher Education

To equip students with these skills, higher education institutions, especially business schools, can implement the following strategies:

Curriculum Design

Developing courses and learning modules centered on IDG principles, with a focus on cognitive, emotional, social, and embodiment skills, can expose students to sustainable development concepts early on (Jakubik et al., 2023). IDG-based curriculum design ensures that students engage with sustainability and cognitive skill development throughout their education.

Interdisciplinary Approach

An interdisciplinary approach helps to contextualize cognitive skills across various fields of study. For example, integrating IDGs in STEM education can enhance problem-solving and critical thinking capabilities, preparing students for diverse professional environments (Līce et al., 2023).

Experiential Learning

Promoting hands-on learning opportunities through project-based learning, internships, and service-learning projects enables students to apply IDG principles in real-world contexts (Donald & Mouratidou, 2022). This practical experience is crucial for developing a deep understanding of how to navigate complexities and make sustainable decisions.

Faculty Development

Training educators on IDG principles is essential to ensure that they can effectively integrate these concepts into their teaching. Providing resources and opportunities for continuous professional development enables faculty to incorporate cognitive skills and sustainability into their pedagogy (Shtaltovna & Muzzu, 2021b).

Assessment and Evaluation

Innovative methods for assessing student development in IDG-related competencies are needed. Reflective assignments, journaling, collaborative projects, and personal development plans offer ways to evaluate how well students are developing cognitive skills aligned with sustainability (Shtaltovna, 2021).

Campus Culture

Creating a campus culture that values inner development fosters an environment where both students and staff are encouraged to explore personal growth and sustainability (Wamsler & Restoy, 2020). Emphasizing community engagement and promoting dialogue around sustainability themes can cultivate a culture of inclusivity and shared purpose.

Collaboration with External Partners

Collaborations with businesses, non-profits, and other educational institutions provide opportunities to extend the application of IDG principles beyond the classroom. Partnering with external stakeholders can enhance the learning experience and provide practical insights into sustainable career practices (Van der Heijden & De Vos, 2015).

Research and Innovation

Encouraging research into inner development and its application in education and sustainable careers supports the continuous evolution of IDG integration (Stålne & Greca, 2022). This research can explore how cognitive skills contribute to sustainable career practices and drive innovation in both academia and industry.

Conclusion

Integrating the IDG framework into business school education offers a powerful tool for fostering cognitive skills essential for sustainable careers. The alignment of IDGs with SCET and the broader context of sustainable development prepares students to become agile, resilient, and ethically minded professionals capable of navigating the complexities of the modern workforce. By embedding these cognitive skills into higher education, we empower students to contribute meaningfully to sustainable development and build careers that are not only successful but also responsible and forward-looking.

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Monitoring and Evaluation of Online Volunteer Tutorial for Alternative Education Students

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Introduction

Addressing the literacy issues of out-of-school persons in the country, the Philippine Republic Act (RA) 9155 mandated the establishment of an Alternative Learning System (ALS) to provide basic education to out-of-school children, youth, and adults. According to RA 9155, ALS is a parallel learning system providing a viable alternative to formal education. It aims to deliver quality education to the underserved Filipinos.

In this research, La Salle Greenhills-Alternative Education (LSGH), a Catholic private school in Metro Manila, offers an ALS Program to overaged and working students to finish their Junior High School Education (Grade 10). These 15 ALS students range from 18-32 years old. As an academic partner of LSGH, the University of the Philippines Cebu Ugnayan ng Pahinungod (Volunteerism) provided online volunteer tutors to coach the ALS students in writing academic essays. Essay writing is one of the major components of the ALS Accreditation and Equivalency (A&E) Assessment. According to the Needs Assessment, the ALS students displayed satisfactory English oral communication performance but needed assistance in writing academic essays acceptable for the ALS Assessment. LSGH requested that the UP Cebu Pahinungod online volunteers guide the ALS students in writing effective essays. The volunteers were UP Cebu faculty, students, staff, and Friends of UP Cebu Pahinungod. For this online volunteerism, they used the internet and digital tools such as Google Meet for online tutorial sessions, Google Classroom for the learning management system, and Facebook Messenger for instant messaging. Although online volunteerism became an alternative to face-to-face volunteerism during the pandemic (Vilbar, 2023), it has been widely used and accepted beyond the pandemic era due to convenience and flexibility (Sun et al., 2023; Lachance, 2021).

As supplementary support, tutorials can enhance student learning through real-time interactions (Doukakis, 2021). They can develop language skills by providing flexibility, interactivity, motivation, immediate feedback, and reflective learning compared to large face-to-face classes (Linardopoulos, 2010; Kamardeen, 2014; and Rodrigues and Vethamani, 2015). With the nature of the ALS students having part-time jobs, online tutorials have become the preferred method. According to Richardson (2016) and Said, A., & Syarif, E. (2016),

students would choose online rather than in-person classes due to convenience, flexibility, and maximizing optimal learning time.

Despite their convenience and flexibility, online tutorials can promote digital divide based on geographical barriers and socioeconomic status (Corrigan, 2012; Lythreatis et al., 2022). Tutors and tutees experience difficulties in accessing online lessons due to technical issues, lack of social contextual cues, unreliable internet, high internet cost, and lack of ICT tools (Hara & Kling, 2000; Alvarez, 2020; Mathew & Iloanya, 2016; Lynch, 2020). Furthermore, the online tutorial environment promotes a climate of loneliness, less personal rapport, and anxiety when not properly planned (Lythreatis et al., 2022; Kaufmann & Vallade, 2022). These issues inspired the UP Cebu Pahinungod Office to dedicate two staff to monitor the online tutorials.

This collaborative research aimed to determine the monitoring and evaluation strategies of the UP Cebu Pahinungod Office in sustaining the tutorial sessions. It sought the following questions: (1) How did the office provide online support to the volunteers during the tutorial? (2) To what extent did the support help the tutors and tutees? (3) What is the impact of volunteerism on the tutees' writing skills and motivation to continue schooling?

Methodology

This study utilized the following qualitative data-gathering procedures to assess the impact: semi-structured interviews, focus-group discussions, and analysis of the recorded tutorial sessions. It used the Elements of Volunteer Management from the Volunteer Onslow: Planning, Connecting with Volunteers, Managing/Retaining Volunteers, and Evaluating. In the planning stage, LSGH and UPC Pahinungod planned the online tutorial program's learning management system, tutorial schedule, writing content focus, and online class attendance mechanism. This research strengthened the attendance mechanism to handle potential nonattendance. According to the ALS studies in the Philippines, attendance and dropout cases became the major issue in implementing ALS programs (Alvarez Jr., 2024; Castillo, 2021; Flores, 2022). Furthermore, according to the LSGH, the majority of the students have odd and part-time jobs while enrolling in the program which consequently affected their attendance. The tutorials were scheduled every Monday in the evenings for two months to support the ALS students' work.

This research used the online modality due geographical location between the ALS students and the UP Cebu Pahinungod volunteer tutors. LSGH is located in Metro Manila which is in the northern Philippines while UP Cebu is located in central Philippines. The 19 volunteers were undergraduate and graduate students, faculty, and staff of UP Cebu, and three non-UP affiliated. The tutorial used the modules from the Department of Education as the main reference but the tutors provided additional writing exercises for reinforcement.

In the Connecting with Volunteers Stage, the tutors had training on conducting online tutorials, team building among fellow volunteers, and orientation about the program. In addition, the tutors and tutees had a "Getting-to-Know You" session to foster positive relationships and lessen anxiety and discomfort. In the Managing/Retaining Volunteers Stage, the Pahinungod Office Staff conducted online semi-structured interviews among the tutors after each session to assess their tutorial experience. The staff also conducted focus-group discussions to clarify tutorial challenges and to recognize the tutors.

Figure 1 shows a student volunteer tutor who guided the student in organizing a paragraph. Figure 2 shows a university staff who coached the student in effective writing techniques to enhance the clarity and coherence of their work. Figure 3 shows a university instructor who advised the student in developing strong arguments and supporting them with relevant examples in their paragraph. All names of the tutors and tutees were pseudonyms to protect their identity.

Figure 1   *Online tutorial session with a university student volunteer*

Figure 2   *Online tutorial session with a university staff volunteer*
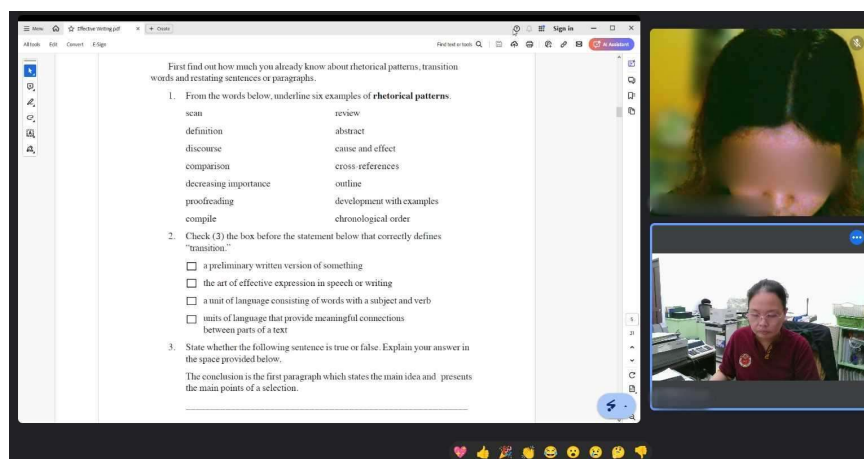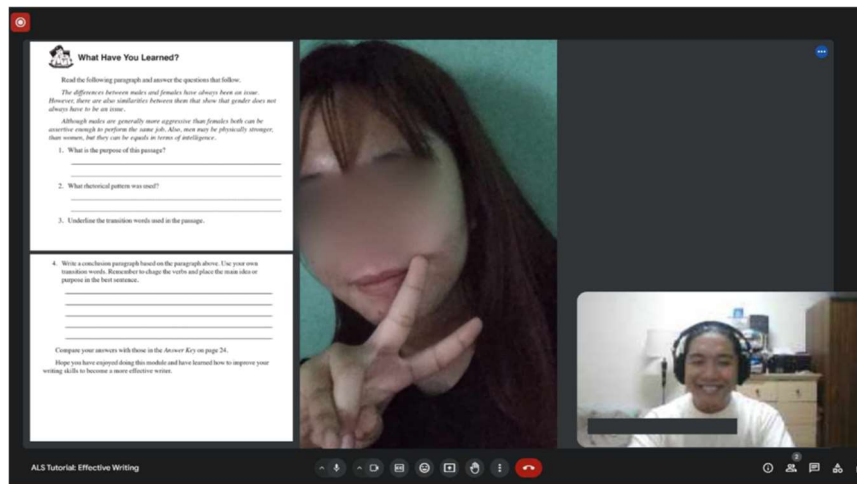
Figure 3   *Online tutorial session with a university instructor volunteer*

Results and Discussion

Online Monitoring and Evaluation Strategies

From the semi-structured interviews and FGD results, tutors claimed that the Volunteerism office provided the following online monitoring and evaluation strategies: (a) promptness in problem resolution; and (b) giving reminders prior to sessions. According to Ashley, "The staff was always ready and swift in solving problems, like reaching out to tutees' who were running late, and might be absent." She added, "Their swift responses solve problems immediately." Another tutor, Bea, said that the social media posting motivated them to continue improving their strategies and exercises. She added, "Photos of other sessions inspire me to innovate my exercise activities." "Photos also affirm my sense of pride in seeing the tutees' progress," she said.

In addition, Tutor Chelsea expressed her challenges during the tutorial sessions. "Lessons of the module are too short. We can cover it in one session but I have to split it." She suggested, "Maybe we can have additional learning materials to use." In addition, she mentioned an instance where her tutee did not make it to the Google Meet link because of an error. "My tutee was absent in one session because she received the wrong Google Meet link." "Maybe the tutees can be briefed thoroughly with the Meet Links and the schedule," she added.

The testimonies of the tutors proved that the monitoring strategies provided by the Office fostered strong assurance and emotional stability in conducting the online tutorial. Recognizing the climate of loneliness and anxiety in an online learning environment (Lythreatis et al., 2022; Kaufmann & Vallade, 2022), the staff promptly responded to issues concerning non-attendance of tutees and instructional materials. According to the FGD, the tutors said that staff were quick and accurate in responding to their immediate technical and instructional questions. The promptness and precision of response is an essential element in online tutorials. For example, the tutors experienced cases of students who were late or absent

during the sessions. They needed to know immediately if these tutees would enter or not in the Google Meet to avoid unnecessary long waiting time. As Doukakis (2021) states, the real-time responses can develop successful online sessions.

In addition, the staff's constant reminders to the tutors before each session made the tutors more focused and organized. According to a university staff volunteer, she became more aware of the tutorial sessions because of the notifications in her social media. The staff's monitoring strategy proved that successful online sessions require constant communication comparable to in-person sessions (Richardson, 2016).

Impact on the Tutees

From the FGD, the ALS students stated that the online volunteerism tutorials developed their writing skills and motivated them to continue their studies. They added that the sessions promoted their ability to write better content in writing tasks and to be more mindful in organizing their ideas.   According to Tutee Ariana she was thankful to her tutor because she explained the Effective Writing Modules clearly. Agreeing with Ariana, Tutee Brian shared that he learned more in writing deeper content because the tutor provided more examples that demonstrated strong content applicable to real-life. He added that unlike the traditional classroom with many students, the tutorial was one-on-one which was customized based on his needs. He expressed his gratitude to the tutor for guiding him.

The sharing of Ariana and Brian demonstrated the power of personalized one-on-one online tutorials and the dedication of the volunteers in improving the academic performance of the tutees. If tutors have the content knowledge and proficiency in using technical tools (Gomez-Rey et al., 2017; Gulbahar and Kalelioglu, 2015) and have the passion to guide the students, the online tutorials would be successful. According to Doukakis (2021) the real-time interaction between the tutor and the tutee during the tutorials can develop language skills, motivation, and reflective learning.

As supplementary support, tutorials can enhance student learning through real-time interactions (Doukakis, 2021). Tutorials can develop language skills by providing flexibility, interactivity, motivation, immediate feedback, and reflective learning compared to large face-to-face classes (Linardopoulos, 2010; Kamardeen, 2014; and Rodrigues and Vethamani, 2015). With the nature of the ALS students to have part-time jobs, online tutorials have become the preferred method. According to Richardson (2016) and Said et al. (2016), students would choose online rather than in-person classes due to convenience, flexibility, and maximizing optimal learning time.

Table 1. *Impact of the tutorial on the ALS students*

Themes	Categories	Sample statements
Developed writing skills	Developed content	Since I've already learned the lesson before, it's easier for me to understand when my tutor discusses it with me. As a fan of writing, I appreciate how her clear explanations and examples have further improved my content.
		My tutor provides examples and guidelines during our classes.
	Developed organization	Honestly, this online tutorial has helped me organize my writing. My tutor discusses the lesson on rhetorical patterns so well, which helps me clarify my ideas, and I can use these skills in my everyday writing. The tutorial improved my writing, especially my essays. The first lesson on rhetorical patterns helped me organize my texts better.
Developed self-directed learning	Tutors promoted active participation	She asks for my opinions when introducing new topics." Her voice is very great. It keeps me attentive to her instructions during our tutorial.
	Tutors showed care	I love how my tutor checks on me first thing after missing a session rather than reprimanding.

Another impact of the volunteerism, it developed self-directed learning because of the tutors' personality of showing care and encouragement. These ALS adult students have part-time jobs which they deem equally important to their studies. Consequently, these jobs became one of the reasons for their absences. However, the students claimed that the tutors motivated them to learn. According to Charlene, she appreciated the tutor's kindness whenever she would ask her, "How are you?" She explained that the gesture became more heartwarming rather than reprimanding about her missed assignments. Furthermore, Ariana shared that she felt empowered when the tutor asked her opinion before starting the topic. She said it made her more confident and encouraged her to participate more.

The experiences of Ariane, Brian, and Charlene proved that online volunteer tutors can transform online learning into a self-directed learning experience if tutors have encouraging motivational behaviors that promote trust and mindfulness (Heliyon, 2020). The tutors did not play as the source of writing knowledge but as facilitators of transformative learning. According

to the tutors, their tutees became more open about their personal life after many sessions. This sharing promoted more engagement and interest in learning (Collison et. al, 2000). As Said et al. (2016) highlighted, successful tutors are the tutors who serve as catalysts and motivators.

Conclusion

The Office of Volunteerism's online monitoring strategies, such as promptness in problem resolution and in giving reminders prior to sessions, promoted emotional security, lesser anxiety, and confidence among the online volunteers. Its prompt and precise online support through Facebook instant messenger built a stronger communication mechanism for running the tutorial sessions. These strong supports were translated into positive impact on the ALS students' learning. The students claimed that the tutorial developed their writing skills and self-directed learning. They shared that the tutors' kindness and volunteerism inspired them to create better writing outputs and to be more participative during tutorials.

Moreover, the researchers recommend more directness from the tutees, with regards to their nonattendance, to allow tutors enough flexibility in responding to their circumstances. Tutors could then arrange makeup sessions or asynchronous writing exercises. Lastly, the researchers recommend to the Office of Volunteerism and La Salle Greenhills: (a) a thorough tutee orientation on the schedule and tutorial platform and the basic protocol of nonattendance and (b) the establishment of a session reminder system for the tutees to prompt their immediate session attendance-nonattendance status.

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Intuitive Decision-Making

Measuring Emotional Intelligence

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Introduction

Measuring Emotional Intelligence (EI) involves assessing an individual's ability to recognize, understand, and manage their own emotions, as well as the emotions of others. Various tools and methods have been developed to quantify EI, ranging from self-report questionnaires to performance-based assessments. Self-report measures, such as the Emotional Quotient Inventory (EQ-i) and the Trait Emotional Intelligence Questionnaire (TEIQue), rely on individuals' subjective evaluation of their emotional abilities. In contrast, performance-based assessments, like the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT), evaluate an individual's actual performance on tasks designed to measure different components of EI, such as emotion perception and regulation. These tools are widely used in both research and organizational settings to explore the role of EI in personal and professional success.In this paper, the authors present the tools used to measure Emotional Intelligence.

Measuring Emotional Intelligence

Emotional intelligence measures tend to use either a self-report personality-based approach, an informant approach, or an ability-based assessment procedure. In his paper, the measurement and psychometric properties of four of the major emotional intelligence measures were discussed (Conte, 2005). He reviewed and examined the comparability of these measures.

- Emotional Competence Inventory,
- Emotional Quotient Inventory
- Multifactor Emotional Intelligence Scale
- Mayer–Salovey–Caruso Emotional Intelligence Test)

Bru-Luna (2021) conducted a systematic review of existing instruments used to assess emotional intelligence (EI) in professionals, focusing on their characteristics and psychometric properties, such as reliability and validity. A literature search was performed using the Web of Science (WoS) database, resulting in 2,761 items that met the eligibility criteria. From these, 40 different instruments were identified and analyzed. Most of these instruments are based on

three primary models—skill-based, trait-based, and mixed—which differ in how they conceptualize and measure EI. Each type of tool has its own inherent advantages and disadvantages. The instruments most frequently reported in the studies include the

- Emotional Quotient Inventory (EQ-i),
- Schutte Self Report Inventory (SSRI),
- Mayer-Salovey-Caruso Emotional Intelligence Test 2.0 (MSCEIT 2.0),
- Trait Meta-Mood Scale (TMMS),
- Wong and Law's Emotional Intelligence Scale (WLEIS), and
- Trait Emotional Intelligence Questionnaire (TEIQue).

Williams et al. (2009) examined the relationships between trait EI, objective measures of emotional ability, and psychopathology, and the factor structure of five measures of emotional skills. According to them, two distinct methods for measuring Emotional Intelligence (EI) are now well established. The first method, self-report measures, involves questionnaires where respondents indicate their level of agreement or disagreement with various statements (e.g., the Trait Emotional Intelligence Questionnaire – Adolescent Short Form [TEIQue – ASF] (Petrides et al., 2006). These measures can be susceptible to socially desirable responding, as individuals may provide answers that present them in a favorable light (Conte, 2005).

The second method, ability-based EI, is assessed by having individuals complete tasks that require elements of EI to perform well (e.g., the MSCEIT, Mayer, Salovey, & Caruso, 2000). These tasks may involve identifying emotions from facial expressions or evaluating the effectiveness of different strategies for managing emotions. However, the scoring methods for some of these tasks have been criticized for lacking full objectivity (Conte, 2005). Additionally, it has been argued that ability-based EI measures assess emotion-related knowledge rather than actual performance and that there is limited evidence supporting the notion that ability EI is a latent trait that can be reliably measured psychometrically (Brody, 2004; Williams et al. (2009)).

Dulewicz and Higgs (2000b) found that, in a sample of general managers, an Emotional Intelligence scale based on 16 relevant competencies demonstrated strong reliability and predictive validity over a seven-year period. Building on these findings and a comprehensive literature review, they aimed to move beyond competency assessment. By developing the questionnaire, Cronbach alpha reliability co-efficiency for each of the element scales ranged from 0.6 to 0.8. The alpha for the overall EIQ score derived from the seven elements was 0.77 (Dulewicz & Higgs, 2000a).

They developed a tailored questionnaire, the Emotional Intelligence Questionnaire (EIQ), designed to specifically assess seven elements of an individual's emotional intelligence through self-report (Dulewicz and Higgs, 1999; 2000a; Dulewicz, Higgs & Slaski, 2003).

1.   self-awareness: being aware of one's feelings and managing them;
2.   emotional resilience: being able to maintain one's performance when under pressure;
3.   motivation: having the drive and energy to attain challenging goals or targets;
4.   inter-personal sensitivity: showing sensitivity and empathy towards others;
5.   influence: influencing and persuading others to accept one's views or proposals;
6.   intuitiveness: making decisions using reason and intuition when appropriate; and
7.   conscientiousness: being consistent in one's words and actions, and behaving according to prevailing ethical standards.

The structure of the second tool, the EQ-i (Emotional Quotient Inventory), is grounded in the existing literature and its author's experience as a clinical psychologist (Bar-On, 1997a). The concept was developed by logically grouping variables and identifying key underlying factors believed to influence effective and successful functioning and promote positive emotional health (Bar-On, 1997b). The EQ-i provides a total EQ score, five composite scale scores, and 15 sub-scale scores, as defined by Bar-On (1997a). This structure, outlined in Table I, was empirically supported through several factor analyses, confirming the 1-5-15 framework of the EQ-i. Thus, the EQ-i represents a hierarchical model of emotional intelligence (Bar-On, 1997a).

EQ-i	EIQ
Intra-personal component	
1. Emotional self-awareness	Self-awareness
2. Assertiveness	Influence
3. Self-regard	Self-awareness
4. Self-actualisation	Motivation
5. Independence	Influence and intuitiveness
Inter-personal component	
6. Empathy	Inter-personal sensitivity
7. Social responsibility	Conscientiousness
8. Inter-personal relationships	Sensitivity and influence
Adaptability component	
9. Reality-testing	Self-awareness and resilience
10. Flexibility	
11. Problem solving	
Stress management component	
12. Stress tolerance	Self-awareness and resilience
13. Impulse control	Resilience and conscientious
General mood component	
14. Optimism	Self-awareness and resilience
15. Happiness	Self-awareness and resilience

Table I.
Potential relationships between the elements of emotional intelligence measured by the EQ-i and EIQ

Accordeing to Zadorozhny et al. (2024) the Trait Emotional Intelligence Questionnaire (TEIQue) is the only inventory that directly and comprehensively operationalizes the trait EI theory (Austin et al., 2008; Petrides et al., 2016).

Finegan (1989) discussed emotional intelligence as a subset of social intelligence and personal intelligences (Gardner, 1983), describing it as a mental ability that facilitates the cognitive processing of emotions (Mayer and Salovey, 1993). Three studies are highlighted to

illustrate the concept of emotional intelligence and its measurement: (1) a study by Mayer, DiPaolo and Salovey (1990) involving 139 undergraduates, which examined the ability to recognize emotional content in visual stimuli; (2) a study by Salovey et al. (1995) with 86 participants, which focused on measuring individual differences in the ability to attend to, clarify, and manage emotions; and (3) a study by Mayer and Geher (1996) with 40 participants, which investigated the accurate identification of emotions. The implications of emotional intelligence for achievement, emotional well-being, and cultural contexts are also discussed.

Emotional Intelligence was assessed by Downey, Papageorgiou and Stough (2006) byusing the Swinburne University Emotional Intelligence Test (SUEIT; Palmer and Stough, 2001) for the workplace. The workplace SUEIT is a 64-item self-report test designed to measure how an individual typically thinks, feels, and behaves at work based on emotional information. Participants rate each statement on a 5-point Likert-type scale (1 = never, 5 = always), indicating the degree to which each statement reflects their usual thoughts, feelings, and actions in a work setting. A second measure of Emotional Intelligence (EI) used by Downey, Papageorgiou and Stough (2006) n the study was the Trait Meta-Mood Scale (TMMS; Salovey et al., 1995). The TMMS is a 30-item self-report instrument where participants respond on a 5-point scale (1 = strongly disagree, 5 = strongly agree). The items are divided into three subscales, based on factor analyses conducted by Salovey and his colleagues: attention to feelings (e.g., "I pay a lot of attention to how I feel"), clarity of feelings (e.g., "I am usually very clear about my feelings"), and mood repair (e.g., "Although I am sometimes sad, I have a mostly optimistic outlook") (Downey, Papageorgiou & Stough, 2006). Preliminary psychometric analysis of the TMMS by Salovey et al. (1995) indicates that this scale can serve as a reliable and valid self-report measure of the ability to monitor and regulate emotions. Their findings show that each subscale of the TMMS captures a coherent and internally consistent construct, with reliability coefficients for attention to feelings for clarity of feelings, and for mood repair. Additionally, the scale demonstrates evidence of both convergent and discriminant validity. The results of Downey, Papageorgiou and Stough, (2006) were:

	M	SD
Emotional intelligence-sueit		
Emotional recognition and expression	39.37	5.14
Understanding of emotion (external)	78.45	7.21
Emotions direct cognition	36.35	6.14
Emotional management	43.03	4.88
Emotional control	32.66	4.47
Emotional intelligence- TMMS		
Attention to feelings	51.27	7.44
Clarity of feelings	46.46	6.30
Mood repair	25.35	3.45
Cognitive style index	30.20	11.94
Transformational leadership	3.23	0.43
Idealised attributes	3.10	0.51
Idealised behaviours	3.19	0.53
Inspirational motivation	3.30	0.53
Intellectual stimulation	3.15	0.59
Individual consideration	3.42	0.54
Transactional leadership	1.94	0.43
Contingent rewards	3.28	0.57
Management by exception (active)	1.50	0.79
Management by exception (passive)	1.04	0.60
Laissez-faire leadership	0.54	0.49

Note: $N = 176$

Table I.
Means and standard deviations for variables included in the study

Tapia, M. (2001) measures emotional intelligence. Tapia (2001) (a) developed a measure of emotional intelligence called the Emotional Intelligence Inventory and (b) identified the underlying dimensions of this inventory by testing 111 high school students at a bilingual college preparatory school. The original inventory consisted of 45 items, but after removing the four weakest items, the reliability coefficient was $\alpha = 0.83$. The revised 41-item inventory was then administered to 319 junior and senior high school students at the same school, resulting in a reliability coefficient of $\alpha = 0.81$. A maximum likelihood factor analysis with varimax rotation identified four factors: empathy, utilization of feelings, handling relationships, and self-control. The psychometric properties of the revised Emotional Intelligence Inventory were robust, making it a suitable tool for investigating emotional intelligence (Tapia, 2001).

Caruso, Mayer and Salovey (2002) research the relation of an ability measure of emotional intelligence to personality. Is emotional intelligence merely a simplistic theory of personality, or does it represent a distinct form of intelligence? For emotional intelligence to be meaningful, it must capture something unique that is not encompassed by standard personality traits. To investigate this, the study examined an ability-based test of emotional intelligence and its relationship to various personality test variables to assess the degree of overlap between these constructs (Caruso, Mayer & Salovey, 2002). Dulewicz, Higgs and Slaski (2003) measure the content, construct and criterion-related validity of emotional intelligence. They summarize existing information on the reliability and validity of two measures of EI, the Dulewicz and Higgs EIQ and the Bar-on EQ-i.

Salovey, Mayer, Caruso and Lopes (2003) measure emotional intelligence as a set of abilities with the Mayer-Salovey-Caruso Emotional Intelligence Test. Mayer,Salovey, Caruso and Sitarenios (2003) measure emotional intelligence with the MSCEIT V2.0. Dulewicz, V., & Higgs, M. (2000) researched emotional intelligence with a review and evaluation study. Schutte et al. (1998) developmed and validated a measure of emotional intelligence. Personality and individual differences. Schutte et al. (1998) developed a measure of emotional intelligence based on the model proposed by Salovey and Mayer (1990) in their work Emotional Intelligence. The initial pool of 62 items was designed to reflect the different dimensions of this model. A factor analysis conducted on responses from 346 participants led to the creation of a 33-item scale. Further studies demonstrated that the 33-item measure had strong internal consistency and test-retest reliability. Validation studies revealed that scores on this measure (a) correlated with eight out of nine theoretically related constructs, such as alexithymia, attention to feelings, clarity of feelings, mood repair, optimism, and impulse control; (b) predicted first-year college grades; (c) were significantly higher for therapists compared to therapy clients or prisoners; (d) were significantly higher for females than males, aligning with previous research on emotional skills; (e) showed no relation to cognitive ability; and (f) were associated with the openness to experience trait within the Big Five personality dimensions.

Groves, Pat McEnrue and Shen (2008). primary measure is based on the Mayer and Salovey (1997) model "Mayer-Salovey-Caruso Emotional Intelligence Test", short MSCEIT9 (Mayer et al., 2003). Existing research indicates that the MSCEIT has robust psychometric properties, including strong construct, convergent, discriminant, and predictive validities, particularly when compared to other emotional intelligence measures (Daus and Ashkanasy, 2005; McEnrue and Groves, 2006; Day and Carroll, 2004; O'Conner and Little, 2003; Brackett and Mayer, 2003). Groves, Pat McEnrue and Shen (2008) specifically examined the measure for its utility for management development applications.

Mayer, J. D., Salovey, P., Caruso, D. R., & Sitarenios, G. (2001). Emotional intelligence as a standard intelligence. Pérez, Petrides and Furnham (2005). Measure trait emotional intelligence. Emotional intelligence. Groves, Pat McEnrue and Shen (2008) develope and measures emotional intelligence of leaders. They empirically test whether it is possible to deliberately develop emotional intelligence as conceptualized in the Mayer and Salovey model. Roberts, Schulze and MacCann (2008) describe the status of measurements of emotional intelligence in 2008.

The latest studies in 2024
Saikia, George, Unnikrishnan, Nayak and Ravishankar (2024) describe thirty years of emotional intelligence. They provide a scoping review of emotional intelligence training

program among nurses. They analyze the stressful environment of healthcare setting that can be detrimental to nurses' mental and emotional health.

Zadorozhny et al (2024) determined the temporal stability of a construct is essential for confirming its validity and usefulness in real-world settings. To date, there have been few studies examining the test-retest reliability of trait emotional intelligence (trait EI), especially over longer durations. The present study provides data from the Trait Emotional Intelligence Questionnaire (TEIQue) over various intervals, ranging from 30 days (one month) to 1,444 days (approximately four years). The findings support trait EI theory, showing strong temporal stability across all levels of the construct, including global, factor, and facet levels.

According to Zadorozhny et al (2024), there are currently few measures of Emotional Intelligence (EI) that have demonstrated test-retest reliability, internal consistency, and validity in terms of a robust factor structure and predictive ability (Davis & Wigelsworth, 2018). To date, there have been limited studies on the test-retest reliability of the Trait Emotional Intelligence Questionnaire (TEIQue) (Perazzo et al., 2021), and most of these studies have not adequately assessed its temporal stability due to their use of short test-retest intervals (Costa & McCrae, 1998; Wood et al., 2022). It has been suggested that intervals of less than a year are considered short-term for evaluating the stability of personality traits (Murray et al., 2003; Schuerger et al., 1989). As a result, using shorter test-retest intervals limits the ability to examine longitudinal changes and may introduce confounding factors such as memory effects (Sovet et al., 2014; Zadorozhny et al (2024)).

Mayer et al (2024) research how many emotional intelligence abilities are there. They provide an examination of four measures of emotional intelligence. Various measures of emotional intelligence have been developed over nearly 25 years to assess the four-area model of emotional intelligence:

- the Multifactor Emotional Intelligence Scale, (MEIS, Mayer, Caruso, & Salovey, 1999),
- the Mayer-Caruso-Salovey Emotional Intelligence Test (MSCEIT, Mayer, Salovey, & Caruso, 2002),
- the Youth Research Version (YRV) of the MSCEIT (MSCEIT-YRV, Mayer, Salovey, & Caruso, 2014) and
- a forthcoming version (MSCEIT-2; Mayer et al., 2023).

According to Yousaf, Javed and Badshah (2024), the interdependent dynamics of innovative work behavior (IWB), innovative culture (IC), employee inventive performance (EIP), and emotional intelligence (EI) become apparent as key factors influencing the creative fabric of firms.

Emotional Quotient Inventory® 2.0 (EQ-i® 2.0)

The EQ-i 2.0 is one of the most advanced and thoroughly researched measures of emotional intelligence in the assessment industry. This tool is indispensable for personal, professional, and leadership development, and for recruiting high performing talent. The EQ-i 2.0 measures a set of emotional and social skills that influence the way people perceive and express themselves, develop and maintain social relationships, cope with challenges, and use emotional information in an effective and meaningful way. The EQ-i 2.0 highlights an individual's emotional and social strengths and weaknesses. A growing body of research suggests that emotional intelligence is a key determinant of success in life.

Assessment Scales

The EQ-i 2.0 includes five validity indices rendering a Total Emotional Intelligence score plus the following composite scores:

- Self-Perception: Self-Regard, Self-Actualisation, Emotional Self-Awareness
- Self-Expression: Emotional Expression, Assertiveness, Independence
- Interpersonal: Interpersonal Relationships, Empathy, Social Responsibility
- Decision Making: Problem Solving, Reality Testing, Impulse Control
- Stress Management: Flexibility, Stress Tolerance, Optimism
- Well-Being Indicator: Happiness

The Trait Meta-Mood Scale 24, with 24 questions, in five-point Likert scale.

1 I pay a lot of attention to my feelings.
2 I am usually very conscious of what I feel.
3 I usually spend time thinking about my emotions.
4 I think my emotions and state of mind deserve to be paid attention to.
5 I allow my feelings to affect my thoughts.
6 I constantly think about my state of mind.
7 I often think about my feelings.
8 I pay a lot of attention to the way I feel.
9 My feelings are clear to me.
10 I can usually define my feelings.
11 I nearly always know how I feel.
12 I usually know how I feel about people.
13 I often become aware of my feelings in different situations.
14 I can always say how I feel.
15 I can sometimes say which emotions I am experiencing.
16 I can manage to understand my feelings.
17 I usually have an optimistic outlook, although I sometimes feel sad.
18 Even when I feel sad, I try to think about pleasant things.
19 When I am sad, I think about all life's pleasures.
20 I try to have positive thoughts even when I feel bad.
21 If I think about things too much and end up complicating them, I try to calm myself down.
22 I am concerned about having a good state of mind.
23 I have a lot of energy when I feel happy.
24 When I am angry, I try to change my state of mind.

Appendix: Mayer-Caruso-Salovey Emotional Intelligence Test (MSCEIT, Mayer, Salovey, & Caruso, 2002), MSCEIT™ measures Emotional intelligence. A Closer Look at the Four Abilities

Perceiving Emotions

What is Perceiving Emotions? Everyone experiences and relates to feelings and emotions. Even the world around you communicates and sends emotional messages. Emotions contain valuable information about relationships and about the world around you. This ability to perceive emotions starts with being aware of these emotional clues, and then accurately identifying what they mean. How is this ability used? You need to be aware of your own feelings and emotions so that you have accurate information about the world around you. Being aware of others' emotions is a key to working with people.

Using Emotions to Facilitate Thought What is Using Emotions?

How we feel influences how we think. If you feel sad, you may view the world one way, while if you feel happy, you interpret the same events differently. People in a sad or negative mood tend to focus on details and search for errors. Those in a more positive mood are better at generating new ideas and novel solutions to problems. Knowing which moods are best for which situations and "getting in the right mood" is an ability. How is this ability used? If you stay aware of your emotions, which contain valuable information, and then use them to solve problems, the outcome may be more positive.

Understanding Emotions

Emotions contain information, and our ability to understand this information and think about it plays an important role in our day-to-day life. This ability answers questions such as: Why are we feeling happy? How will my friend feel if I say that to him? What will happen if I say that to her? How is this ability used? Insight into ourselves, and others, may require emotional knowledge. This knowledge helps us to understand people better.

Managing Emotions

What is Managing Emotions? If emotions contain information, then ignoring this information means that we can end up making a poor decision. At times, we need to stay open to our feelings, learn from these feelings, and use this information to make decisions and to take appropriate action. Sometimes, though, it may be best to disengage from an emotion and return to it later in order to manage it effectively. How is this ability used? If you can find the right balance in managing your emotions, you should be more sucessfull.

Wong and Law's Emotional Intelligence Scale (WLEIS),

Instrucciones: A continuación, encontrará algunas afi rmaciones sobre sus emociones y sentimientos. Lea atentamente cada frase e indique por favor el grado de acuerdo o desacuerdo con respecto a las mismas [Instructions: Here you will fi nd some statements about your emotions and feelings. Please read carefully each statement and indicate the extent to which you agree or disagree with that statement] Evaluación de las propias emociones [Self-Emotion Appraisal, SEA]

1. La mayoría de las veces sé distinguir porqué tengo ciertos sentimientos [I have a good sense of why I have certain feelings most of the time]
2. Tengo una buena comprensión de mis propias emociones [I have good understanding of my own emotions]
3. Realmente comprendo lo que yo siento [I really understand what I feel]
4. Siempre sé si estoy o no estoy feliz [I always know whether or not I am happy] Evaluación de las emociones de los demás [Other´s Emotion Appraisal, OEA]
5. Conozco siempre las emociones de mis amigos a través de sus comportamientos [I always know my friends' emotions from their behaviour]
6. Soy un buen observador de las emociones de los demás [I am a good observer of others' emotions]
7. Soy sensible a los sentimientos y emociones de los demás [I am sensitive to the feelings and emotions of others]
8. Tengo una buena comprensión de las emociones de las personas que me rodean [I have good understanding of the emotions of people around me] Uso de las emociones [Use of Emotion, UOE]
9. Siempre me fi jo metas y luego intento hacerlo lo mejor para alcanzarlas [I always set goals for myself and then try my best to achieve them]
10. Siempre me digo a mi mismo que soy una persona competente [I always tell myself I am a competent person]
11. Soy una persona auto-motivadora [I am a self-motivating person]
12. Siempre me animo a mi mismo para hacerlo lo mejor que pueda [I would always encourage myself to try my best] Regulación de las emociones [Regulation of Emotion, ROE]
13. Soy capaz de controlar mi temperamento y manejar las difi cultades de manera racional [I am able to control my temper so that I can handle diffi culties rationally]
14. Soy capaz de controlar mis propias emociones [I am quite capable of controlling my own emotions]
15. Me puedo calmar fácilmente cuando me siento enfadado [I can always calm down quickly when I am very angry]
16. Tengo un buen control de mis propias emociones [I have good control of my own emotions]

Appendix: Brief Emotional Intelligence Scale- 10 (BEIS-10)

This instrument can be found at: Davies et al. (2010): Validity and reliability of a brief emotional intelligence scale (BEIS-10).

1= Strongly Disagree to 5= Strongly Agree

Appraisal of own emotions

1. I know why my emotions change
2. I easily recognize my emotions as I experience them

Appraisal of others' emotions

3. I can tell how people are feeling by listening to the tone of their voice
4. By looking at their facial expressions, I recognize the emotions people are experiencing

Regulation of own emotions

5. I seek out activities that make me happy
6. I have control over my emotions

Regulation of others' emotions

7. I arrange events others enjoy
8. I help other people feel better when they are down

Utilization of emotions

9. When I am in a positive mood, I am able to come up with new ideas
10. I use good moods to help myself keep trying in the face of obstacles

Schutte Emotional Intelligence Scale (SEIS)

Schutte et al (1998) describe appraisal and expression of emotion (13 items), Regulation of emotion (10 items), Utilisation of emotion (10 items).

1.   I know when to speak about my personal problems to others.
2.   When I am faced with obstacles, I remember times I faced similar obstacles and overcame them.
3.   I expect that I will do well on most things I try.
4.   Other people find it easy to confide in me.
5.   I find it hard to understand the nonverbal messages of other people.
6.   Some of the major events of my life have led me to re-evaluate what is important and not important.
7.   When my mood changes, I see new possibilities.
8.   Emotions are some of the things that make my life worth living.
9.   I am aware of my emotions as I experience them.
10. I expect good things to happen.
11. I like to share my emotions with others.
12. When I experience a positive emotion, I know how to make it last.
13. I arrange events others enjoy.
14. I seek out activities that make me happy.
15. I am aware of the nonverbal messages I send to others.
16. I present myself in a way that makes a good impression on others.
17. When I am in a positive mood, solving problems is easy for me.
18. By looking at their facial expressions, I recognize the emotions people are experiencing.
19. I know why my emotions change.
20. When I am in a positive mood, I am able to come up with new ideas.
21. I have control over my emotions.
22. I easily recognize my emotions as I experience them.
23. I motivate myself by imagining a good outcome to tasks I take on.
24. I compliment others when they have done something well.
25. I am aware of the nonverbal messages other people send.
26. When another person tells me about an important event in his or her life, I almost feel as though I have experienced this event myself.
27. When I feel a change in emotions, I tend to come up with new ideas.
28. When I am faced with a challenge, I give up because I believe I will fail.
29. I know what other people are feeling just by looking at them.
30. I help other people feel better when they are down.
31. I use good moods to help myself keep trying in the face of obstacles.
32. I can tell how people are feeling by listening to the tone of their voice.
33. It is difficult for me to understand why people feel the way they do.

Trait Emotional Intelligence Questionnaire (TEIQUE), TEIQUE v.1.50

Short Form TEIQUE-SF

Well-being (5, 9, 20, 24, 12, 27); self-control (4, 7, 15, 19, 22, 30); emotionality (1,2,8,13,16,17,23,28); sociability (6 ,10, 11,21,25, 26)

1= Completely Disagree to 7= Completely Agree

1. Expressing my emotions with words is not a problem for me.
2. I often find it difficult to see things from another person's viewpoint. *
3. On the whole, I'm a highly motivated person.
4. I usually find it difficult to regulate my emotions. *
5. I generally don't find life enjoyable. *
6. I can deal effectively with people.
7. I tend to change my mind frequently. *
8. Many times, I can't figure out what emotion I'm feeling. *
9. I feel that I have a number of good qualities.
10. I often find it difficult to stand up for my rights. *
11. I'm usually able to influence the way other people feel.
12. On the whole, I have a gloomy perspective on most things. *
13. Those close to me often complain that I don't treat them right. *
14. I often find it difficult to adjust my life according to the circumstances. *
15. On the whole, I'm able to deal with stress.
16. I often find it difficult to show my affection to those close to me. *
17. I'm normally able to "get into someone's shoes" and experience their emotions.
18. I normally find it difficult to keep myself motivated. *
19. I'm usually able to find ways to control my emotions when I want to.
20. On the whole, I'm pleased with my life.
21. I would describe myself as a good negotiator.
22. I tend to get involved in things I later wish I could get out of. *
23. I often pause and think about my feelings.
24. I believe I'm full of personal strengths.
25. I tend to "back down" even if I know I'm right. *
26. I don't seem to have any power at all over other people's feelings. *
27. I generally believe that things will work out fi ne in my life.
28. I find it difficult to bond well, even with those close to me. *
29. Generally, I'm able to adapt to new environments.
30. Others admire me for being relaxed.
* Reverse scored

Well-being: [Self-esteem; Happiness; Optimism],

Self-control: [Emotion Regulation; low Impulsiveness; Stress Management]

Emotionality: [Empathy; Emotion Perception; Emotion Expression; Relationship Skills]

Sociability: [Emotion management; Assertiveness; Social awareness/ Social Competence]

Auxiliary facets: [Adaptability; Self-motivation]

Swinburne University Emotional Intelligence Test (SUEIT)

Palmer & Stough, 2001

EI: Emotional Recognition and Expression (ERE); Understanding Emotions External (UE);

Emotions Direct Cognition (EDC); Emotional Management (EM); and Emotional Control (EC).

1=Never, 2= Seldom, 3= Sometimes, 4= Usually, 5= Always

1. I can tell how others are feeling.
2. I generate positive moods and emotions within myself to get over being frustrated.
3. Examination of feelings is useful in solving problems.
4. When I'm anxious I can remain focused on what I am doing.
5. I can tell whether others like each other or not.
6. When I'm under stress, I tend to irritate those around me.
7. I find it difficult to talk about my feelings with others.
8. I find it hard to determine how others are feeling from their body language alone.
9. Difficult situations elicit emotions in me that I find hard to overcome.
10. Others find it easy to pick-up on how I am feeling.
11. I find it difficult to keep from getting stressed out when I am under a lot of pressure.
12. My moods and emotions help me generate new ideas.
13. I can tell how others feel by the tone of their voice.
14. When I am anxious, I find it difficult to express this to others.
15. I find it easy to influence the moods and emotions of those around me.
16. I don't easily pick-up on the emotional overtones of the environment I am in.
17. I can tell when others are trying to hide their true feelings.
18. I try not to let my emotions guide me when problem solving.
19. I find it easy to control my anger.
20. I can describe my feelings on an issue to others.
21. I don't think it's a good idea to use emotions to guide my decision making.
22. I find it hard to identify if somebody is upset without them telling me.
23. I find it hard to get people to cooperate with each other.
24. I come up with new ideas using rational thoughts rather than my moods and emotions.
25. I find it hard to concentrate on a task when I'm really excited about something.
26. I can portray how I'm feeling to others through my body language.
27. I find it hard to determine friendships between people I don't know well.
28. I overcome conflict with others by influencing their moods and emotions.
29. I watch the way people react to things when I'm trying to build rapport with them.
30. My problem solving is based on sound reasoning rather than feelings.
31. I find it difficult to think clearly when I'm feeling anxious about something.
32. I have trouble finding the right words to express how I feel.
33. I find it difficult to get others excited about things.
34. I can pick-up on the emotional 'overtone' of the discussion.
35. I attend to my feelings on a matter when making important decisions.
36. I overcome anger by thinking through what's causing it.
37. Others know when I am worried.
38. I readily understand the reasons why I have upset someone.
39. I find it hard to reduce anxiety in others.
40. I weigh-up how I feel about different solutions to problems.
41. I can be upset and still think clearly.
42. I find it hard to convey my anxiety in others.
43. I can determine when other's emotional reactions are inappropriate.
44. I find it easy to comfort others when they are upset about something at work.
45. Other's facial expressions reveal a lot to me about the way they are feeling.
46. I find it difficult to control strong emotions.

47. Feelings should be kept at bay when making important decisions.
48. I readily notice the 'feel' of different environments.
49. When something gets me down I find it difficult to snap out of it.
50. I go with my 'feelings' when making important decisions.
51. I can detect my emotions as I experience them.
52. When discussing an issue, I find it difficult to tell whether others feel the same way as me.
53. Thinking about how I felt in certain situations helps me to remember them.
54. I can easily snap out of feeling down.
55. I find it hard to distinguish my emotions.
56. I can tell when someone feels the same way as myself about another person without actually discussing it.
57. I find it difficult to maintain positive moods and emotions when I'm under stress.
58. When others get worked-up I stay out of their way.
59. I find it hard to determine exactly how others feel about issues I have with them.
60. When something goes wrong in my life, I find it difficult to remain positive.
61. Others can easily tell how I feel.
62. I try to keep emotions out of my decision making.
63. I can tell when someone doesn't really like me.
64. When someone upsets me, I think through what the person has said and find a solution.

Conclusion

It could be shown that Emotional Intelligence can be measured with different scales. The authors recommend further research on this connection.

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Managing Intuitive and Emotional Intelligence for Digital Wisdom and the Future

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Extended Abstract

The significance of digital literacy in today's society is widely recognized. It has become increasingly evident that emotional intelligence (Goleman, 2011) holds greater importance in the digital era, particularly in light of the ongoing crisis in sensemaking. This crisis encompasses the pervasive confusion and uncertainty surrounding the definitions of truth, morality, and wisdom, along with the challenges posed by misinformation and disinformation. The swift advancement of technology and the omnipresent influence of social media have exacerbated this crisis, necessitating the ability of individuals and societies to navigate the digital landscape with heightened discernment. This paper posits that the fundamental competencies of the future will include emotional intelligence (comprising mindfulness, intuitive acuity, embodiment, empathy, and awareness of emotional triggers); digital literacy (which entails a foundational understanding of digital economies, digital media, and media literacy); and essential psychological insights (addressing human biases, conditioning, suggestion, contagion effects, motivation and more) (Anthony, 2022, 2013).

A central tenet of this paper is that merely grasping the workings of software and hardware, as well as the economic frameworks underlying the internet and social media (digital literacy), is inadequate for fostering a robust level of self-awareness and self-empowerment in the digital age. This inadequacy arises because major tech firms have adeptly mastered the techniques of capturing users' attention and sustaining their engagement through algorithms and behavioral nudges. Consequently, there is an urgent need to broaden the conventional spectrum of human cognitive abilities. This expansion is vital not only to promote greater mindfulness and present-mindedness but also to encourage a deeper sense of embodiment within our digital interactions.

Emotional intelligence, which encompasses mindfulness, intuitive acuity, and the cultivation of wisdom, is an essential aspect of Marcus T. Anthony's (2022, 2023) framework of Digital Wisdom. Digital Wisdom is structured around three key areas: Know Thyself, Know the Humans, and Know the Machines. This framework has been purposefully developed to move beyond the now outmoded notion of Digital Literacy, which is closely aligned with the third domain of Digital Wisdom: Know the Machines (Anthony, 2022, 2023). By merging emotional intelligence with digital literacy, this paper seeks to advocate for teaching these concepts within

a wider framework that recognizes the interplay between technological advancements and human emotions.

The paper will begin by clarifying the definitions of emotional intelligence and digital literacy, followed by an examination of the relevance of Digital Wisdom in the contemporary digital landscape, particularly amidst the current AI explosion (Anthony, 2022, 2023). Subsequently, the discussion will outline various contemporary issues through which these concepts can be applied in concert. The crisis in sensemaking will be explored in depth, along with associated developments, including rising rates of anxiety, depression, and suicide, a crisis of meaning, and diminishing trust in media, compounded by the spread of misinformation and disinformation across various platforms.

The interrelationship between emotional intelligence, mindfulness, present-mindedness, and embodiment is increasingly acknowledged. Daniel Goleman (2011) highlights the significance of self-awareness and emotional regulation as fundamental components of mindfulness, suggesting that nurturing mindfulness can enhance emotional intelligence. This enhancement enables individuals, whether online or offline, to react to emotional stimuli in a more thoughtful and "intelligent" manner. Jon Kabat-Zinn (2013), who is renowned for creating Mindfulness-Based Stress Reduction programs, supports this idea, asserting that mindfulness practices can lead to improved empathetic responses. Such improvement is critical in an increasingly fragmented and divided digital culture, where understanding and compassion often take a back seat to division.

Moreover, Patricia Jennings (2015) emphasizes the importance of mindfulness within educational contexts, advocating for its incorporation to promote emotional intelligence among educators and students alike. Her research underscores the necessity of resilience in confronting the challenges of modern education, particularly regarding emotional and psychological well-being. This paper will draw on Jennings' findings to demonstrate how emotional intelligence can be cultivated in educational environments, preparing future generations with the competencies needed to flourish in a complex digital ecosystem.

Additionally, the implications of emotional intelligence and digital literacy extend beyond individual well-being; they profoundly influence organizational and societal dynamics. As workplaces become increasingly digital and interconnected, it is essential for leaders and employees alike to develop emotional intelligence to foster collaboration, innovation, and trust (Goleman, 2011). Organizations that prioritize emotional intelligence within their cultures are better equipped to navigate the complexities of the digital era, as they can address challenges with empathy, agility, and insight.

In summary, the integration of emotional intelligence and digital literacy is not merely advantageous; it is vital for successfully maneuvering through the intricacies of the digital age. By embracing the concept of Digital Wisdom, as articulated by the author (Anthony, 2023) we

can create a more comprehensive approach to education and personal development that equips individuals to thrive amidst the challenges posed by misinformation, emotional distress, and the rapid evolution of technology. Ultimately, this paper advocates for a paradigm shift in how we perceive and teach these competencies, fostering a future where emotional intelligence and digital literacy coexist harmoniously, empowering individuals to make wise and informed choices in their personal and professional endeavors.

Keywords: emotional intelligence, digital literacy, mindfulness, crisis in sensemaking, well-being, resilience, artificial intelligence, intuition, misinformation, disinformation.

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Rational and Intuitive Decision-Making in the Area of Sustainability: a Review of Literature

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Introduction

In today's complex global environment, the pursuit of sustainability has become a critical priority for organizations, governments, and individuals alike. As we face unprecedented challenges related to climate change, resource depletion, and social inequality, decision-making processes have taken center stage in shaping a sustainable future. The way we make decisions - whether through rational analysis or intuitive judgment - can significantly influence the effectiveness and impact of sustainability initiatives.

Although sustainability is gaining recognition as an important research area (e.g. Markard et al. 2012; Baumgartner, 2014; Ceschin & Gaziulusoy, 2016; Engert, Rauter & Baumgartner, 2016), additional studies are necessary to explore how managers incorporate sustainability principles into their everyday decision-making and project operations. This highlights a need for further research to identify effective strategies and methods for embedding sustainability into the routine processes of project management (Silvius et al., 2017). Therefore, the aim of this study is to conduct a literature review on rational and intuitive decision-making in the field of sustainability.

The intended audience for this study includes academics and researchers focused on decision-making theories, sustainability, and project management. It also targets managers and decision-makers, particularly in sectors like energy, manufacturing, and corporate social responsibility, who are looking for practical ways to integrate sustainability into their daily operations. Additionally, sustainability professionals, such as consultants, sustainability officers, and environmental analysts, who aim to apply decision-making frameworks to achieve sustainable results, will find value in this research. Lastly, policy makers and government officials, interested in how decision-making processes shape sustainability initiatives and influence regulatory policies, are also key readers.

The article consists of five sections. After the introduction, the key principles of the sustainability concept will be presented. Next, the nature of rational and intuitive decision-making will be explained. The following section will showcase the existing research findings on rational and intuitive decision-making for sustainability. The article ends with conclusions.

Sustainable development - basic principles

The dynamic economic growth in the second half of the 20th century not only contributed to increasing prosperity in many developed countries but also led to accelerated environmental depletion and the impoverishment of populations. In response to these problems, the concept of sustainable development emerged. It integrates elements from multiple disciplines, including natural sciences, social sciences, and the humanities. Over the years, it has been defined and interpreted in various ways (e.g. Spangenberg, 2011; Morioka & de Carvalho, 2016; Amui et al., 2017). The concept of sustainable development arose from concerns about the Earth's ecosystem's ability to withstand the pressures caused by human activity. It was a deliberate effort aimed at preventing, or at least reducing, the imbalance between economic growth and social development, as well as between socio-economic development and the natural environment. That is why, the sustainable development, in the literature (e.g., Purvis et. al, 2019), is described using the three-column (pillars) model, the equilateral triangle model, or the three overlapping circles model - see Figure 1. These models indicate that sustainable development can only be achieved by treating all three areas equally, without any one area dominating the others.
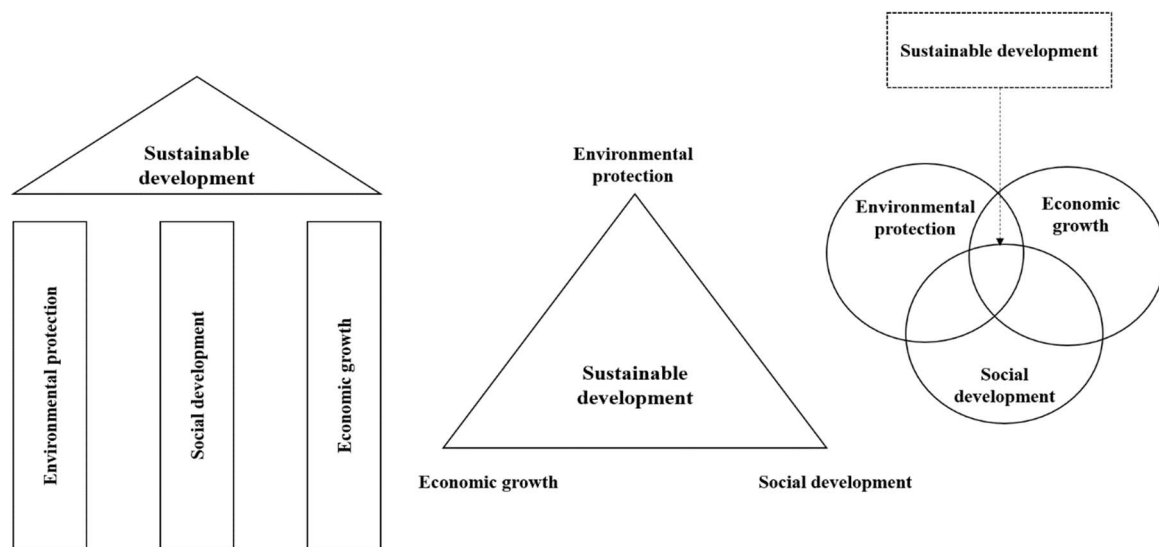
Figure 1. Models describing the concept of sustainable development
Source: Purvis et. al, 2019, p. 682.

The term "sustainable development" was introduced into global discourse by the United Nations (UN) bodies. The concept was first mentioned during the UN Conference on the Human Environment, held in Stockholm in 1972. Its precursor was the notion of "ecodevelopment", described as a development strategy focused on the rational use of local

resources and the knowledge held by farmers for the benefit of isolated rural areas in the Third World (Nowak, 2022).

The concept of sustainable development is currently described through the lens of the Sustainable Development Goals (SDGs). This is a set of 17 goals and 169 targets, adopted by the UN General Assembly in 2015 as part of the "2030 Agenda". These goals provide a concrete list of priority actions and directions aimed at achieving sustainable development globally. Among them, one can identify (Mio et al., 2020): (1) "No Poverty", (2) "Zero Hunger', (3) "Good Health and Well-Being", (4) "Quality Education", (5) "Gender Equality", (6) "Clean Water and Sanitation", (7) "Affordable and Clean Energy", (8) "Decent Work and Economic Growth", (9) "Industry, Innovation and Infrastructure", (10) "Reduced Inequalities", (11) "Sustainable Cities and Communities", (12) "Responsible Consumption and Production", (13) "Climate Action", (14) "Life below Water", (15) "Life on land", (16) "Peace, Justice and Strong Institutions", (17) "Partnership for the Goals".

Rational and intuitive decision-making - basic principles

The exploration of decision-making processes is far from new and has been developing for approximately 300 years, drawing insights from various disciplines (Oliveira, 2007). These contributions have included establishing mathematical bases for economics and applying decision theories to diverse fields such as finance, medicine, the military, and cybernetics. Consequently, decision theories have integrated numerous widely recognized concepts and models, which significantly impact nearly all biological, cognitive, and social sciences (Oliveira, 2007). Among different concepts, attention is given to rational and intuitive decision-making.

Rational behavior, judgment, and decision-making serve as foundational models for understanding individual actions in both economic practice (Kahneman et al., 1982) and behavioral economics (Camerer et al., 2004). Rational explanations of thought and behavior are crucial for our everyday understanding of one another's actions (Bratman, 1987), play a key role in economic and social science theories (Binmore, 2008), and form the basis of cognitive information-processing theories (Oaksford & Chater, 2007).

In rational decision-making models, decision-makers evaluate multiple potential alternatives across various scenarios before making a choice. They assess these scenarios based on their probabilities, allowing them to estimate the expected outcomes for each option. The final decision is the one that offers the most favorable expected outcome and the highest likelihood of success - Figure 2. Rational decision-making models describe how decision-makers use a specific set of alternatives to address problems (Hoch et al., 2001).
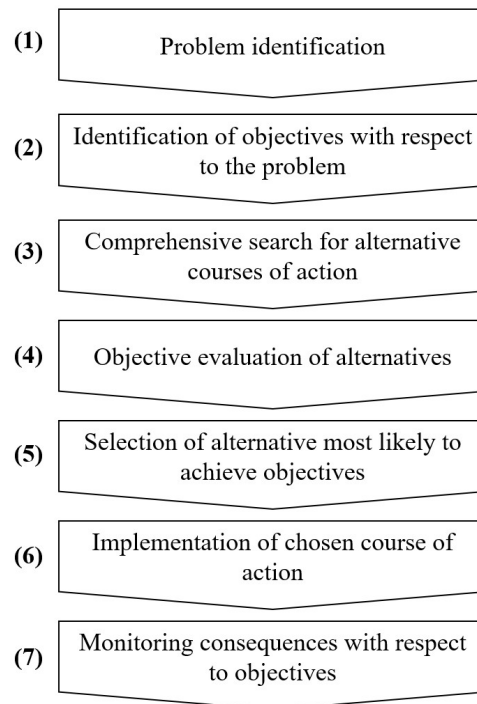
Figure 2. Stages of rational decision-making

Source: Heracleous, 1994, p. 17.

Similarly, intuition is a concept with multiple definitions (Taggart, 1997). It continues to be a vague and ambiguous phenomenon within the field of decision-making (Sinclair, 2014). Reber (2017) characterized intuition as an innate judgment process that occurs without deliberate thought or conscious awareness. In a similar vein, Bowers et al. (1990) defined intuition as the recognition of patterns, meanings, and structures that are initially not consciously perceived but ultimately guide decision-making.

Intuition can be seen as complementing rather than opposing rational analysis (Hodgkinson & Sadler-Smith, 2003). Prior to this, Epstein et al. (1996) provided strong empirical support for the idea that these two modes of processing are not mutually exclusive. They introduced the concept of two distinct constructs - rationality/experience and analysis/intuition - that together shape behavior. Today, the complementary nature of these constructs is widely recognized (e.g. Thanos, 2022).

Decision-making in the area of sustainability

At the outset, it is worth noting that few studies have thus far focused on decision-making models in the area of sustainable development (e.g. Zavadskas et al., 2016; Depczyński, et al., 2023; Malik, 2024; Mai et al., 2024). For example Bolis et al. (2017) investigated how different decision-making rationalities relate to sustainable development, aiming to understand better how to advance a more sustainable development model. Their review encompassed

151 studies examining the link between rationality and sustainability. The literature reviewed uniformly stressed the necessity of moving away from the current decision-making framework, which is largely driven by instrumental rationality - a method criticized for its excessive focus on self-interest. The authors emphasize the importance of adopting alternative rationalities to support sustainable development, such as: (1) substantive rationality, which involves incorporating sustainability values into decision-making processes; (2) communicative rationality, which fosters cooperation and coordination to achieve more sustainable outcomes; (3) bounded rationality, which takes into account human cognitive limitations and the complex nature of sustainability issues. Additionally, Kibert et al. (2011) present a framework aimed at embedding sustainability principles into decision-making processes. This framework is crafted to ensure that sustainability considerations are consistently integrated into both organizational and project-specific decisions. It seeks to balance environmental, economic, and social factors to secure long-term, sustainable results (Kibert et al., 2011).

Nevertheless, to the best of the authors' knowledge, none of the existing studies have addressed whether rational or intuitive decision-making is more effective in the area of sustainability.

Achieving sustainability requires a balance between rigorous analysis and intuitive insight. Rational and intuitive decision-making approaches can complement each other to produce more effective and adaptive strategies. For example, a rational analysis provides a structured framework essential for evaluating various sustainability options. It involves methodical examination of data, applying quantitative tools such as cost-benefit analysis and life-cycle assessment to evaluate environmental, social, and economic impacts. This structured approach ensures that decisions are based on objective criteria, leading to well-supported and justifiable outcomes. For instance, Ren et al. (2013) employed Multi-Criteria Decision Making (MCDM) to evaluate various biomass-based technologies for hydrogen production. They developed a framework that incorporates fifteen criteria spanning economic, environmental, technological, and socio-political dimensions to assess sustainability. The study analyzed four biomass-based technologies - pyrolysis, conventional gasification, supercritical water gasification, and fermentative hydrogen production. The MCDM approach identified biomass gasification as the most sustainable technology among the options, recommending it for further development and implementation.

On the other hand, intuition brings valuable insights that are often crucial in complex or novel situations where data alone may not suffice. Intuitive decision-making relies on an individual's or group's accumulated experience and gut feelings, allowing for rapid judgments in scenarios where time and information are limited. This ability to quickly navigate uncertainties and make decisions in the face of ambiguous or unprecedented challenges can complement the thorough analysis provided by rational methods (Menzel, 2013). In situations where quick decisions are

necessary - such as during environmental crises or in time-sensitive projects -intuition can provide immediate insights that help make informed choices without waiting for exhaustive analysis.

One of the key benefits of integrating rational and intuitive methods in the area of sustainability is enhanced flexibility. Decision-makers often face dynamic and uncertain environments where conditions can change rapidly. Rational analysis provides a detailed examination of options, but it may not always account for sudden shifts or emerging trends. Intuitive decision-making, however, allows individuals to adapt quickly to changing circumstances, leveraging their experience and instincts to navigate new challenges effectively.

By blending these approaches, decision-makers can strike a balance between thorough analysis and the ability to respond swiftly to unforeseen developments. This adaptability is crucial for sustainability, where the ability to pivot and adjust strategies in response to new information or changing conditions can significantly impact the effectiveness of sustainability initiatives.

To enhance the decision-making process in the area of sustainability, it is considered essential to (Rudolph & Bauer, 1999; Munck & Tomiotto, 2019):

- educate people about values related to sustainability, including ethics, cooperation, and environmental stewardship, to shape their personal choices.
- ensure accountability for decision-makers to enhance collective actions and collaborative decision-making, especially for decisions affecting society and the environment.
- advocate for systemic reforms in the existing development model.

Conclusion

In summary, merging rational and intuitive decision-making approaches presents considerable benefits for promoting sustainability. Rational analysis offers a structured framework and data-driven insights, while intuition provides crucial context and swift judgment in complex situations. The integration of these methods enables decision-makers to adopt a more balanced, adaptable, and innovative strategy for sustainability. This combined approach enhances the effectiveness and flexibility of strategies designed to tackle environmental, social, and economic challenges. As global sustainability concerns intensify, utilizing both rational and intuitive decision-making will be vital for crafting and executing successful strategies toward a sustainable future.

As noted, there has yet to be research that simultaneously analyzes the effectiveness of rational and intuitive decision-making in the context of sustainability. Therefore, in the future,

the authors recommend conducting empirical studies comparing the effectiveness of rational versus intuitive decision-making approaches. This could involve analyzing how each approach influences decision outcomes, stakeholder satisfaction, and sustainability impacts. It is also proposed to examine how different contexts such as industry type, geographic location, and organizational size - affect the applicability and outcomes of rational and intuitive decision-making approaches in sustainability. By exploring these areas, future research can enhance our understanding of how to effectively utilize both rational and intuitive decision-making methods to improve sustainability outcomes.

The authors hope that the presented discussion will serve as inspiration and a basis for further research on sustainability and decision-making models.

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Speed and Timing of intuitive Decision-Making

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Introduction

Dual-process theories have been proposed to explain human reasoning and judgment. The central feature of these theories is the attribution of responses to two types of thinking described either as heuristic versus analytic (Evans, 1989), associative versus rule-based (Sloman, 1996), experiential versus analytic (Epstein, 1991), System 1 versus System 2 (Stanovich, 1999), gist versus verbatim (Reyna & Brainerd, 1995) or Type 1 versus Type 2 (Evans, 2008). There are many points of disagreement, theorists generally agree that there are heuristic processes (Type 1) that are fast, automatic, unconscious, and require low effort (Kahneman, 2003, Kahneman and Klein, 2009).

Dual Process Theory: Time difference between rational and intuitive decision-making

Dual-process theories differentiate between two types of cognitive processes: fast, automatic, and intuitive (Type 1), which are more prone to errors, and slow, controlled, and deliberate (Type 2), which are more analytical. When time constraints are tight, performance tends to rely more on the low-effort Type 1 processes, resulting in a higher likelihood of biases (Andrzejewska et al, 2013).

Many adult judgment biases are considered to result from fast heuristic responses, often referred to as default responses, because they are the first thoughts that come to mind. These fast, automatic reactions are central to Type 1 processes, a key aspect of intuitive thinking that requires minimal cognitive effort or control (Betsch & Glöckner, 2010; Glöckner & Betsch, 2012). In contrast, Type 2 processes are characterized by their slow, conscious, deliberate, and effortful nature, requiring significant engagement of central working memory resources. As a result, Type 2 processes are believed to be influenced by individual differences in cognitive capacity, whereas Type 1 processes are generally considered independent of cognitive ability (Evans & Stanovich, 2013).

Many theories describe thinking as a combination of qualitative-heuristic and quantitative-analytic processing. Fuzzy-trace theory, in particular, suggests that intuitive reasoning emerges from qualitative-heuristic processes that focus on the gist or essential meaning of a problem. In contrast, quantitative-analytic processes are detail-oriented and work with the

precise, verbatim details of a problem. As individuals age, gain education, and practice within a specific domain, they become more adept at extracting and processing the gist of a situation, leading to a greater reliance on intuition. Fuzzy-trace theory, therefore, places intuition at the highest level of cognitive development (Reyna, 2004, 2012, 2013), setting it apart from other dual-process theories. Experts, within their area of expertise, can quickly grasp the gist of a situation, whereas novices must rely on cognitively demanding analytic processes to handle the exact details of the problem. While other dual-process theories attribute much of intelligent behavior to skilled analytic reasoning, fuzzy-trace theory highlights the importance of intuitive reasoning. It proposes that both types of reasoning occur simultaneously, with task demands determining which type dominates behavior (Reyna & Brainerd, 1995, 2011).

Sahm and von Weizäcker (2015) examine how reason and intuition impact decision-making over time. When dealing with a series of similar problems, individuals can choose to make decisions rationally, following expected utility theory, or intuitively, following case-based decision theory. While rational decisions tend to be more accurate, they also incur higher costs, although these costs may diminish over time. The study finds that intuition can ultimately outperform rational decision-making if individuals have enough ambition. Additionally, intuitive decisions are more common at the early and late stages of a learning process, while rational decision-making tends to dominate in the middle stages (Sahm & von Weizäcker, 2015).

When individuals estimate the amount of time that can be saved by increasing the speed of an activity, they often fall prey to a time-saving bias (Svenson, 2008). This bias leads them to overestimate the potential time savings that come from increasing speed. In the context of driving, judgments about time savings due to speed increases tend to follow the Proportion heuristic, which suggests that people intuitively estimate time savings based on the proportionate change in speed rather than the actual time saved (Svenson, 1970, 2008).

Rapid Responses to Situations

Individuals in occupations that involve crisis situations, such as police officers, firefighters, and paramedics, develop crucial decision-making habits that enable them to respond intuitively to sudden emergencies. This ability is largely the result of extensive drill training. Through rigorous and repeated practice, these professionals cultivate nearly automatic (intuitive) decisions and actions, rooted in past learning and drills, so that their responses become "second nature." Such intuitive reactions are essential in these fields, as they allow for rapid and effective decision-making in high-pressure situations (Patton, 2003).

These intuitive responses are not unique to emergency professions; they also occur in everyday experiences, such as recalling lyrics when hearing a melody or remembering a poem segment in response to specific stimuli. Similar patterns are evident in sports and the performing arts, where the ability to react accurately within split-second timing is clearly

intuitive. This is despite the fact that thorough analysis, which leads to appropriate decisions and actions, often involves highly complex issues that would typically require substantial time to reach effective conclusions—time that is not available in these high-pressure situations. During the initial stages of learning, these decisions do require significant time to process, but with practice, they become increasingly intuitive (Patton, 2003).

Intuitive reactions are essential or highly beneficial in situations that demand sudden, instantaneous, and accurate actions, or when the circumstances are highly complex. While much of this intuitive ability is developed through learning and experience, there is also an innate aspect that allows some individuals to excel beyond others, regardless of the effort others put in (Patton, 2003).

This process of developing intuitive reasoning is evident in learning to read. It begins with the practice of recognizing individual letters, progresses to recognizing words, and eventually leads to the recognition of entire phrases. Over time, the ability to read evolves from slowly piecing together letters to fluently interpreting extensive written material (Patton, 2003).

It's important to note, however, that intuitive decisions are not always made in an instant. Often, even in decisions that are carefully thought out, there can be an intuitive component. A decision-maker who is conscious of the influence of intuition and understands its role in shaping choices is likely to achieve an effective balance between the careful analysis of data and alternatives and the intuitive insights that guide decision-making. This balance is crucial for making well-rounded decisions that benefit from both logical deliberation and instinctive understanding (Patton, 2003)..

Unconscious Thought Theory

Dijksterhuis and Nordgren (2006) identified two distinct modes of thought: unconscious and conscious. Each mode has unique characteristics that make it more suitable for different situations. Contrary to common assumptions, conscious thought is more effective for making decisions about straightforward issues, while unconscious thought tends to be more advantageous for dealing with complex matters. This distinction highlights the different strengths of each mode depending on the complexity of the decision at hand (Dijksterhuis and Nordgren, 2006).

Humans often engage in extended thought processes, especially when facing significant decisions or working on scientific discoveries, which can span months or even years. Dijksterhuis and Strick (2016) propose that during these periods of sustained thinking, progress is made not only through conscious deliberation but also while individuals are consciously focused on something else—essentially engaging in unconscious thought. Their review of the literature on unconscious thought (UT) processes reveals substantial evidence supporting its existence. When viewed as a form of unconscious goal pursuit, UT is particularly

effective for thought processes that are complex, significant, or personally engaging. We also explore other characteristics of the UT process that contribute to its effectiveness in these contexts (Dijksterhuis & Strick, 2016).

In numerous experiments, Dijksterhuis compared participants who were distracted with those who made a decision immediately after being presented with decision-related information (immediate decision condition), a comparison also frequently used in creativity research. However, this comparison does not necessarily confirm the presence of an active unconscious thought (UT) process, as distraction could simply cause participants to forget some of the relevant information. For instance, when deciding between two job offers, distraction might lead participants to forget trivial details while retaining crucial information. In such cases, distracted participants might make better decisions, but this improvement wouldn't necessarily be due to an active UT process (Dijksterhuis & Strick, 2016).

Another noted advantage of distraction is its ability to help individuals break free from fixation on incorrect solutions (Schooler & Melcher, 1995; Smith & Blankenship, 1989). For example, when writing, you might find yourself unable to create a satisfactory opening for a new paragraph because you're "stuck" on a sentence that doesn't feel quite right—like a needle stuck in a groove. Taking a short walk or having a cup of coffee can help you forget the unsatisfactory sentence, allowing you to start fresh. However, demonstrating that distraction leads to better outcomes than continuous, uninterrupted work on a problem does not necessarily provide evidence of an active unconscious thought (UT) process (Dijksterhuis & Strick, 2016).

Participants are distracted from further conscious thinking about the problem, which prevents any potential negative impact that conscious thought might have after an initially accurate impression—an effect some researchers believe could explain the unconscious thought (UT) effect (Lassiter et al., 2009; Payne et al., 2008). Additionally, the potential benefits of distraction, such as forgetting irrelevant information (Shanks, 2006) or overcoming fixation (Smith & Blankenship, 1989), would be expected to improve performance in both groups. However, an increasing number of studies indicate that participants in the UT condition consistently perform better than those who are simply distracted (Dijksterhuis & Strick, 2016).

Theory on Incubation

The benefit of setting a problem aside to aid in finding solutions has been a topic of interest among theorists for at least a century. Wallas (1926, p. 80) built on Poincaré's (1910) earlier exploration of mathematical creativity, identifying the stage during which a problem is not actively thought about as "Incubation" (Gilhooly, 2016). When someone steps away from an unsolved problem for a while, they may suddenly experience an unexpected insight into the solution. This phenomenon is referred to as incubation (Smith and Blankenship, 1989) in

combination with intuition and problem-solving (Dorfman, Shames & Kihlstrom, 1996; Lebed, 2017).). There is substantial evidence from laboratory studies supporting the benefits of Delayed Incubation, which suggests that taking a break from a problem after working on it for a while can be advantageous (Dodds et al., 2012, for a qualitative review). A quantitative meta-analysis by Sio and Ormerod (2009) found a positive effect of Delayed Incubation (Gilhooly, 2016). The theory of incubation is mainly researched regarding Creative problem solving, however, there is a strong connection to intuition (Gilhooly, 2016)..

According to Smith and Blankenship (1989), after an initial phase of unsuccessful attempts to solve a problem, a person might either persist with uninterrupted work or temporarily set the problem aside, revisiting it later. The concept of "incubation" in a laboratory setting refers to the improved performance observed in those who return to a problem after a delay, compared to those who work on it continuously. According to the forgetting-fixation hypothesis, during the initial problem-solving phase, incorrect solutions may become entrenched, making correct solutions less accessible. Over time, forgetting or reduced accessibility of these fixated incorrect solutions can make the correct solutions more accessible, thereby facilitating the incubation effect. (Smith & Blankenship, 1989).

There is further evidence from various types of experiments, including those focused on incubation and problem-solving. The unconscious thought (UT) paradigm is partly rooted in research on incubation in creativity (e.g., Wallas, 1926; Orlet, 2008). This research suggests that taking a break or allowing thoughts to incubate can enhance problem-solving and creative thinking, supporting the idea that UT processes can contribute to better outcomes in certain contexts (Dijksterhuis & Strick, 2016).

Sio and Ormerod (2009) recently reviewed this body of literature and concluded that an incubation period does indeed aid creative problem-solving. However, the moderators they identified do not clearly indicate whether these effects are due to genuine unconscious thought (UT)—an active cognitive process—or simply the result of other outcomes from a period of distraction, such as forgetting irrelevant information or misleading cues, without necessitating the assumption of an active UT process (see also Orlet, 2008; Dijksterhuis & Strick, 2016).

Orlet's (2008) review and synthesis of the literature on incubation reveals several key points: (a) experimental studies on incubation primarily focus on observing and measuring cognitive-mental processes; (b) current research on incubation seldom addresses the variability in psychological states during the incubation phase, particularly when solving interpolation and dialectic problems; and (c) sensory-perceptual phenomena, such as the formation of symbols during incubation, are not adequately considered. The review also highlights the need for developing methodologies that account for the full spectrum of cognitive-mental and sensory-perceptual processes involved in fostering novel insights and original discoveries (Orlet, 2008; Dijksterhuis & Strick, 2016).

Smith and Blankenship (1989) proposed that during the initial stages of problem solving, the retrieval of incorrect information and strategies from memory can obstruct the recall of the correct information and strategies necessary for effective problem solving. Overcoming this fixation, a key component of the incubation process, involves forgetting—or reducing the accessibility of—irrelevant or inappropriate information, making the correct information relatively more accessible. This overall concept is known as the forgetting-fixation hypothesis (Smith and Blankenship, 1989).

Gilhooly outlines three primary explanations for the effects of incubation: Unconscious Work, where problem-solving continues subconsciously; Intermittent Work, where breaks allow for renewed focus and fresh perspectives; and Beneficial Forgetting, where time away from the problem helps reduce fixation on incorrect solutions, making it easier to access the correct information when returning to the task (Gilhooly, 2016).

However, there are studies in which incubation effects were not observed, such as those conducted by Gall and Mendelsohn (1967), Dominowski and Jenrick (1972), and Olton and Johnson (1976). Stories such as Coleridge composing the poem *Kubla Khan* in a dream, Mozart envisioning complete compositions flawlessly, and Kekulé discovering the benzene ring structure in a dream have been shown to be inaccurate (Weisberg, 2006, pp. 73–78).

Intuitive Decision-Making as a gradual Process: The Process of Spreading Activation

Intuition has been defined as the instantaneous, experience-based impression of coherence elicited by cues in the environment. In a context of discovery, intuitive decision-making processes can be conceptualized as occurring within two stages, the first of which comprises an implicit perception of coherence that is not (yet) verbalizable. Through a process of spreading activation, this initially non-conscious perception gradually crosses over a threshold of awareness and thereby becomes explicable. Because of its experiential basis, intuition shares conceptual similarities with implicit memory processes. (Zander et al, 2016)

Within this two-stage model, Bowers et al. (1990) suggest that the cognitive processes underlying intuitive hunches are continuous rather than discrete. According to this continuity model, intuition is viewed as a gradual process that begins with an initial, implicit perception of a complex and ambiguous input and evolves into a more explicit understanding, where individuals can articulate why and how certain pieces of semantic information are connected. Over time, this sense of coherence develops implicitly. As more environmental cues suggest a particular interpretation, these cues accumulate meaning, activating related representations in memory (Zander et al, 2016).

To empirically examine their two-stage model of intuition, Bowers et al. (1990) designed several experimental paradigms, including the triads task, which has since become a widely

used tool for studying intuitive decision-making processes (Bolte and Goschke, 2005; Ilg et al., 2007; Topolinski and Strack, 2009a,b; Remmers et al., 2014).

This model aligns with the idea that unconscious thought helps organize information. For example, Ritter and Dijksterhuis (2014) proposed, based on their empirical findings, that during periods of unconscious thought (such as during incubation), representations become more organized and polarized, and memory shifts toward being more gist-based. Their results imply that unconscious thought is a process in which disorganized information gradually becomes more structured until a certain threshold is reached, at which point conclusions can be brought to conscious awareness (Ritter and Dijksterhuis, 2014).

A common empirical result from studies using the triads task is that participants are notably accurate in distinguishing between coherent and incoherent triads, even during the initial guiding stage, where they cannot explicitly identify the common associate (CA) (Bowers et al., 1990; Bolte et al., 2003; Bolte and Goschke, 2005; Ilg et al., 2007). The results have been interpreted as supporting a genuine continuity in the underlying perceptual-cognitive processing of information. This interpretation is based on the observation that semantic processing triggered by sensory input spreads gradually, potentially converging on common semantic nodes. Which model best describes the underlying cognitive and neural processes taking place in the triads task remains an open research question. Thus, the intuitive perception of semantic coherence develops gradually over time, making the continuity model a better fit for explaining both behavioral performance and neural activation observed in the triads task. (Zander et al., 2016).

Strategic Decision-Making and Intuition

According to Mintzberg (1994), strategy cannot be planned because it involves synthesis—a blending of ideas and resources—while planning focuses on analysis, which entails breaking down and examining the parts. This distinction between analytic and synthetic processes reflects a previously discussed duality in human information processing (see Taggart and Robey, 1981). Mintzberg (1994) describes the idea of planning strategy as an oxymoron because it conflates two fundamentally distinct cognitive processes: analysis and synthesis (Sinclair, Sadler-Smith and Hodgkinson, 2009).

Sinclair, Sadler-Smith and Hodgkinson (2009) describe intuition as a rapid, nonsequential mode of information processing that incorporates both cognitive and emotional (including somatic) elements. Khatri and Ng (2000) as well as Miller and Ireland (2005) also assume, intuition in strategic decision-making would be fast. see, However, the nature of strategic decision-making is, it is not fast.

Calabtretta et al. (2016) propose a three-step process for managing the tension between intuition and rationality through paradoxical thinking. Their empirical data suggest that this

process begins with preparing the foundation for paradoxical thinking by fostering managerial acceptance of the contradictory elements inherent in both rational and intuitive decision-making approaches. The next step involves developing decision-making outcomes by integrating intuitive and rational practices. Finally, the outcomes of paradoxical thinking are embedded within the organizational context. For each step, the model outlines a set of practices that leverage either the intuitive or rational aspects of decision-making, which practitioners can use to navigate this cognitive tension at different stages of the process (Calabtretta et al., 2016). According to them, the intuitive process encompasses problem definition, analysis, and synthesis. However, these stages occur more rapidly and are largely non-conscious, with each stage being deeply intertwined with the others ((Calabtretta et al., 2016). Calabtretta et al (2016) describe a paradoxon: The paradox arises from the fact that intuition and rationality represent two fundamentally different modes of thinking, yet both are essential for effective strategic decision-making (Lewis, 2000). the rationality–intuition tension can stem from the one-sided focus on rationality and analytical thinking among organizational decision makers (Cabantous & Gond, 2011; Callon, 2009).

The intuitive process occurs without deliberate, rational thought and is often accompanied by a strong sense of certainty (see also Simon, 1987; Epstein et al., 1996; Shapiro and Spence, 1997; Sinclair et al., 2002). However, in strategic decision-making, in can be questioned if decisions are made rapid. Razher it seems, they meant a slow intuitive decision-making (Sinclair, Sadler-Smith and Hodgkinson, 2009).

In strategic management, intuitive processing is associated with the rapid "digestion" of complex and ambiguous information sources, complementing—but not necessarily replacing—rational processing (see Mintzberg, 1976; Louis and Sutton, 1991). This process involves a non-conscious scanning of internal resources stored in long-term memory (Reber, 1989) and external cues from the environment (Klein, 1998) to identify relevant information that fits into a "solution picture," similar to assembling a jigsaw puzzle. As the pieces start to come together and make sense, the "big picture" suddenly emerges, often accompanied by a sense of certainty or relief (Sinclair and Ashkanasy, 2005: 357). It is important to note that while intuition and insight are related, they are not the same (Sinclair, Sadler-Smith and Hodgkinson, 2009). They describe a continuum in which non-conscious cognitive processes help interpret relevant environmental cues, match these cues with existing patterns, or detect mismatches—such as when a decision-maker senses that something is "off" or "doesn't feel right" (Klein, 1998). These cognitive processes are accompanied to varying degrees by emotional responses or affect (Sinclair, Sadler-Smith and Hodgkinson, 2009).

Conclusion

It could be shown that intuitive decision-making is not always fast. The concept of Unconscious Thoughts and Incubation describe a time-delayed intuitive decision-making. In strategic decision-making, authors assume a fast-decision-making process. We argue, that strategic decisions are never taken in short time. Therefore intuition can surely be also slow.

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Literature Study on Rational and Intuitive Decision-Making

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Introduction

Today, intuition is an important decision-making theory across various disciplines, e.g management, sociology, psychology and philosophy combined (Sinclair & Ashkanasy, 2005; Hodgkinson et al., 2008; Dane & Prat, 2009; Hogarth, 2010) as well as in neuroscience (LeDoux 1996; Barais et al, 2015, 2017, 2018; Craig, 2002; Damasio, 1999; Korteling and Toet, 2020), behavioural sciences (Hodgkinson et al., 2008) para-psyachology (Bem, 2011; Bem et al., 2015, Radin, 2017) as well as medicine and health sciences (Glatzer et al., 2020; Chlupsa et al., 2021) or engineering and design (Cash & Maier, 2021; de Rooij et al., 2021).

Intuition is described in various ways in management (Simon, 1987; Agor, 1989; Behling & Eckel, 1991; Shapiro & Spence, 1997; Burke & Miller, 1999; Andersen, 2000; Akinci & Sadler-Smith, 2011; Gore & Sadler-Smith, 2011; Hodgkinson & Sadler-Smith, 2018; Cristofaro, 2019; Sadler-Smith, 2022; Paliszkiewicz, Çetin, Launer, 2023), strategic decision-making (Wally & Baum, 1997; Brockmann & Anthony, 1998; Hodgkinson et al., 2009a; Callabnretty et al., 2017;), in different industries (Launer, Çetin, Svenson, Ohler, 2021), supply chain management (Carter et al., 2017), as well as different management level (Paliszkiewicz, Çetin, Launer, 2021).

There are many measurement studies and instruments on rational and intuitive decision-making. However, each study uses different approaches. There is no literature study out there yet describing all dimension. The latest literature study by Pietrzak, Launer and Svenson (2022) is a great starting point-

Theoretical Foundation based on existing Studies

Single Process Approaches

Rational Decision-Making

Rational decision-making is often described as an Information processing (Epstein, 1990) or cognitive style (Messick, 1984; Riding & Rayner, 1998; Antonietti, 2003; Pachur & Bröder, 2013). Scott & Bruce (GDMS, 1995) describe the Analytical Style as a search & evaluation process using a logic and systematic analysis and evaluation in terms of specific goals (Keen, 1974; Mitrof, 1983). This can also be based on Allinson and Hayes' theory (1996) or Riding's (1997) analytic style. Burns & D`Zurilla, (PMPI, 1999) describe the rational processing style as a structured thinking process, fact-based, goal-oriented, and evaluating alternatives based on stress (Aldwin, 1994; Lazarus & Folkman, 1984) and problem solving (D'Zurilla & Goldfrid, 1971; D'Zurilla & Nezu, 1990, Mayde u-Olivare s & D'Zurilla, 1996).

Cools, & van den Broek (CoSI, 2007) and Pachur & Spaar (USID, 2015) describe two different rational decision-making styles mainly based on education and experimental psychology (Grigorenko & Sternberg, 1995; Rayner & Riding, 1997, 1998), Messick, 1984; Miller, 1987; Hunt, Krzystofiak, Meindl, & Yousry, 1989; Riding & Cheema, 1991), perception, learning, problem solving, decision making, communication, and creativity in important ways (Hayes & Allinson, 1994; Kirton, 2003), field-dependent and field-independent (Witkin, Moore, Goodenough & Cox, 1977); information processing (Shipman & Shipman, 1985), learning and innovation (Sadler-Smith & Badger, 1998), and industrial, work, and organizational psychology (Hodgkinson, 2003) and management (Hodgkinson & Sadler-Smith, 2003).

One dimension is the Knowing Style based on facts, details, logical, reflective, objective, impersonal, rational, precise, methodical decisions (Allinson & Hayes, 1996; Myers & McCaulley, Quenk, & Hammer, 2003. Miller, 1987. Riding & Cheema, 1991) which is empirically related to the REI study (Pacini & Epstein, 1999). Cools, & van den Broek (2007) found this style to be similar to existing conceptualizations of the analytic pole, e.g. Allinson and Hayes' theory (1996) or Riding's (1997) analytic style.

On the other hand is the Planning Style described as sequential, structured, conventional, conformity, planned, organized, systematic, routine-based (Allinson & Hayes, 1996; Miller, 1987; Riding, Cheema, 1991). The planning style is empirically related to the Adaptiveness pole of the KAI (Kirton, 1994) and the REI study by Pacini and Epstein (1999). Cools, & van den Broek (CoSI, 2007) mention the Creating Style based on Myers, McCaulley, Quenk, & Hammer (2003) which was not used in this study. This style is related to existing conceptualizations of the intuitive pole (Cools, & van den Broek (2007), such as intuition in Allinson and Hayes' theory (1996) or the innovativeness pole of Kirton (1994).

Dual Process Approaches

The basic, historical approach is the dual process theory distinguishing between rational decision-making (Deliberation) and intuition. Several frameworks in psychology assume a dual-process (Chaiken & Trope, 1999; Epstein, 2008; Hammond, 1996; Ham & Van den Bos, 2011; Kahneman, 2011; Mukherjee, 2010; Sloman, 1996; Stanovich & West, 2000; Evans & Stanovich, 2013; Evans, 2008; Keck & Tang, 2020). There are two perspectives within the dual process theory: the unitary view postulates that cognition and intuition are opposite poles of a single dimension, whereas the dual-process view proposes that they are independent constructs (Hodgkinson et al., 2009b). There are two major studies with a dual approach that develop scales and items.

The study Rational-Experiental Inventory (REI) by Epstein, Pacini & Norris (1998) and the new version by Pacini & Epstein (1999) was based on the Cognitigve-Experiental Self-Theory (CEST) by Epstein, Pacini, Denes-Raj & Heier (1996). They describe decision-making with a Rationality Scale (Need for Cognition or Analytical-Rational Thinking) and an Intuitive-Experiental Scale or faith for intuition. In principal, they relate to Jung (1964/1968), natural decisions by Tversky & Kahneman (1983), automatic decisions by Bargh (1989) and Higgins (1989), heuristic (Chaiken, 1980; Fiske & Taylor, 1991), schematic (Leventhal, 1984), prototypical (Rosch, 1983), narrative (Bruner, 1986), implicit (Weinberger & McClelland, 1991), imagistic-nonverbal (Bucci, 1985; Paivio, 1986), experiential (Epstein, 1983), and mythos (Labouvie-Vief, 1990). Pacini and Epstein (1999) relate their inventory to the big five theory researched by D. W. Fiske (1949), and later expanded upon by others, including Norman (1967), Smith (1967), Goldberg (1981), and McCrae & Costa (1987).

They describe intuition in an Experiental Scale or faith for intuition or Intuitive-Experiental. They describe intuition based on the so-called gut feeling, hunches, instincts, feelings, snap judgement, heart (Buck, 1985; Leventhal, 1984; Jung, 1964/1968), deliberative-effortful-intentional-systematic (Bargh, 1989; Chaiken, 1980; Higgins, 1989), explicit (Weinberger & McClelland, 1991), extensional (Tversky & Kahneman, 1983), verbal (Bucci, 1985; Paivio, 1986), and logos (Labouvie-Vief, 1990).

The second key study using a dual approach is the Preference for Intuition or Deliberation according to Betsch (2014, PID) based on Epstein et al (1996). She distinguishes into Deliberation or Analytical and Planning (Cacioppo & Petty, 1982) and Affective Intuition (Jung, 1962; Slovic, Finucane, Peters, & MacGregor, 2001, Loewenstein, Weber, Hsee, & Welch, 2001; Myers & McCaulley, 1986; Keller et al. 2000). She bases her theory on the concept of Interoception (Wilson & Schooler, 1991; Wilson, Lisle, Schooler, Hodges, Klaaren, & LaFleur, 1993), routinized decision making (Betsch, Haberstroh, Molter, Glöckner, 2004; Betsch, Haberstroh, Hohle, 2002), implicit attitude formation (Betsch, Plessner, Schwieren, & Gütig, 2001), predictive behavior (Epstein, 1983), the processes, contents, and correlates of intuition

(Hogarth, 2001); reasoning (Sloman, 1996), the context of discovery (Bowers, Regher, Balthazard, & Parker, 1990), and behavioral interests, personality, and experiences (Langan-Fox & Shirley, 2003).

More and more, theories view the relationship between the rationality and intuition as more complex (Thompson et al., 2009). Krajbich et al. (2015), De Neys and Pennycook (2019) and De Neys, (2021) show a revised dual-process models comparing fast and slow intuition. Bago and De Neys (2017) sketch a revised dual process model in which the relative strength of different types of intuitions determines reasoning performance. Pennycook et al. (2015) showed a three-stage model to explain what causes analytic thinking to occur. Therefore, the concept of rationality needs to be described more comprehensively.

On the way to a multidimensional approach of intuition

Today, researchers in the field of intuition more and more follow a multi-dimensional and interdisciplinary approach (Shirley & Langan-Fox, Sadler-Smith & Shefy, 2007, 1996; Cristofaro, 2019; Sinclair, 2011, 2014, 2020). Based on Dane & Pratt`s and Sinclair`s constructs, many scholars followed developed a broader theory on intuition (Hodgkinson et al., 2008, 2009a, 2009b; Sadler-Smith, 2010, 2015, 2016; Blume and Covin, 2011; Akinci and Sadler-Smith, 2012, 2013, 2019; Baldacchino, 2013, 2019; Baldacchino et al., 2015; Healey et al., 2015; Sadler-Smith et al., 2021; Okoli et al., 2021). Gore and Sadler-Smith (2011) disaggregate intuition by discriminating between domain-general mechanisms and domain-specific processes, primary and secondary types of intuition. Cristofaro (2020) describes in depth an Affect-Cognitive Theory. But there is still a need for comprehensive model due to the lack of synergies between scholars from different disciplines (Adinolfi & Loia, 2022).

Intuition is not a homogeneous concept, but a label used for different cognitive mechanisms (Glöckner & Witteman, 2010; Hogarth, 2010; Pratt & Crosina, 2016). There were conceptual shortcomings stemming from the tendency to ignore the philosophical heritage of intuition or to dismiss the relevance of this heritage to contemporary theory (Osbeck, 1999, 2001).

Multi-dimensional Approaches of Intuitive Decision-Making

There are five multidimensional studies with a more detailed, structured dimensions on intuition. Intuition according to Scott & Bruce (1995, GDMS) was decribed in four styles based on the items by Bruce (1991). The first style is intuitive-based (Hunt et al, 1989; Harren, 1979), based on feelings (Keen, 1973), and a learned habit (Driver, 1979; Driver et al.,1990). The second style was dependent decisions (Harren, 1979; Phililips, Pazienza & Ferrin, 1984). This was also described by Simon (1987) as intuition based on interpersonal interaction or women`s intuition (Snodgrass, 1985) and lately in neurobiology (Marks-Tarlow, 2014). Later Lieberman (2007) goes even beyond describing dependent decision based on social cognitive neuroscience in: (a) understanding others, (b) understanding oneself, (c) controlling oneself,

and (d) the processes that occur at the interface of self and others. The third subdimension Avoidant was not used in this study (Driver, 1970; Behling, Gifford & Tolliver, 1980; Driver et al, 1990). In their stiudy they found the fourth dimension called Spontaneous.

Burns & D`Zurilla (1999, PMPI) describe intuitive decision-making designed to assess a person's awareness and perception of his or her dominant mode of processing across stressful situations (Aldwin, 1994; Folkman & Lazarus, 1980; Pearlin & Schooler, 1987; Carver, Scheier, & Weintraub, 1989; Tobin et al., 1989) and the cognitive -experiential self-theory (CEST) by Epstein (1990, 1994). The CEST theory described intuition as an experiential intuition focusing on such qualities as the speed and 224mpulses224y of processing (minimal time and mental effort); the reliance on feelings, vibes, hunches, and instincts) and the recall of past coping experiences and familiar coping responses (Burns & D`Zurilla, 1999). Based on a content analysis of the item clusters, exploratory and confirmatory factor analyses, the three factors were named rational processing, emotional processing, and automatic processing. The Automated Processing is described as quickly and efficiently, swiftly, aware, repetitive and experience-based (Burns & D`Zurilla, 1999). In the literature, it was described as fast and efficient, outside of awareness, unintentional, and uncontrolled (Bargh, 1994; Smith, 1994; Shiffrin & Schneider, 1977) based on expertise (Carter et al., 2017). Logan (1988, 1989) described it as an automatic memory retrieval, Bargh (1994) as a goal-dependent automaticity and for Smith (1994) it was all about speed and efficiency. It is an immediate knowing of how to cope based on past coping experiences (Burns & D`Zurilla, 1999). The Emotional Processing described as instincts, feelings, vibes, gut feeling, hunches, and emotions (Burns & D`Zurilla, 1999). People with a preferfernce to emotional processing aren more extraverted, preferring emotional and interpersonal relationships, and are more adaptive for emotion-focused coping, expressing emotions and seeking social support. Later Miller and Ireland (2005) describe strategic decision making based on holistic hunches and automated expertise. Pretz et al (2014, TintS; Denin et al., 2022) described intuitive decision-making in three dimensions based on the literature review by Pretz & Totz (2007). Intuition has a holistic nature of intuition (Jung, 1971; Hammond, 1996) described as knowing without being able to explain how we know (Vaughan, 1979). The first sub dimension is Affective Intuition based on feelings (Bastick, 1982), a feeling of certainty (Hogarth, 2001), or emotional processing (Epstein, 1998; Bechara, Damasio, & Damasio, 2000). Affective intuition was described as body impulses incl. heart-based, emotions, hunches (anticipation), and gut feeling decisions (Pretz et al., 2014). The second type of intuition is Inferential Intuition (Hill, 1987) as an automated (Vaughan, 1979) and heuristical (Wescott, 1968; Forgas, 1994) type of intuition in an implicit judgmental sense (Greenwald & Banaji, 1995). It is also described as experience-based, quick, familiar decisions with reasoning, logic (Klein, 1998, Sternberg et al., 2001). Third type of intuition is a Holistic Style (Jung, 1926; Hammond, 1996) or holistic mechanism (Bowers, Regehr,

Balthazard, & Parker, 1990; Dijksterhuis, 2004; Wilson & Schooler, 1991) which was divided by an factor analysis into a Holistic Big Picture Intuition and a Holistic Abstract Intuition (Pretz et al., 2014). The holistic-associative view of intuition is acknowledged also by psychology researchers (Agor, 1986; Kihlstrom, 1987; Shapiro & Spence, 1997; Betsch & Glöckner, 2010; Glöckner & Witteman, 2010) as well as management scholars (Dreyfus & Dreyfus, 1986; Simon, 1987; Prietula & Simon, 1989; Kahneman & Tversky, 2000) and lately by Adinolfi & Loia (2022).

Pachur and Spaar (2015, USID) distinguish in domain-specific perspective based on previous studies e.g. PID, REI, GDMS, CoSI, PMPI) two major dimensions. First, the quick Spontaneous Intuition and Experience-based Style described as experienced (Boucouvalas, 1997), immediate, swiftly, quick, snap decisions, awareness, experience, repetitive decisions and heuristics (Gigerenzer et al., 2011) by experts (Pachur, 1986 & Marinello, 2013). The importance of experience has been researched best by Klein (1998) in his recognition-primed decision model. Pachur and Marinello (2013) described that expert are more likely to rely on a lexicographic heuristic, whereas the non-experts used a more complex strategy, that aggregates across different cues (Garcia-Retamero & Dhami, 2009).

Second is the Affective Intuition based on feelings, body impulses, and hunches, inner reactions, knowledge of human nature, life experience, gut feeling, hunches, heart (Burns & D`Zurilla, 1999; Pretz et al., 2014; Betsch, 2014). Affective intuition is still a rather broad descrition of many different feelings, body impulses, and moods. Therefore, this dimension on intuition will be deepened.

New Dimensions for intuitive Decision-Making

Launer and Cetin (2023) describe new dimensions and styles in their Measurement and Instrument Study. The new dimension will be described briefly.

Body Impulses

Different kind of feelings are a source of intuitive decision-making (Bonabeau, 2003; Burke & Miller, 1999; Dane, Pratt, 2006; Klein, 2003; Sinclair, Ashkanasy. 2005) and relief or certitude (Cappon, 1994; Petitmengin-Peugeot, 1999). Results of the collection of senses in the internal state of the body (interoception or body Impulsess) from neurology and medicine (LeDoux 1996; Barais et al, 2015, 2017, 2018; Craig, 2002; Cameron, 2002; 2009; Barrett, Simmons, 2015; Khalsa, Lapidus, 2016; Damasio, 2008; Damasio, Tranel & Damasio, 1991) showed that emotional processes guide (or bias) decision-making, e.g. in the homoestatic sensory activity (Craig, 2002, 2009). The concept of gut feeling needs to described newly from a broad and unspecific term to a more differentiated approach based on feelings in the stomach, colon and the visceral sensory system (Gershon, 2001; Hooper et al, 2001: Barbosa, Rescigno, 2010; Mayer, 2001; Arumugam et al 2011; Brandtzaeg, 2011; Cryan, Dinan, 2012; Haller,

Hörmannsperger, 2013; Schemann, 2020). The interoception and somatic markers of the heart beating rate influences decision-making (Schandry, 1981; Polatos, Schandry, 2004; Dunn et al, 2007; Pollatos, Herbert, B. M., Matthias, Schandry, 2007; Garfinkel et al, 2015; Schulz, 2016) and skin arousals (Loggia, Juneau, Bushnell, 2011; Breimhiorst et al, 2011).

Anticipation

The described scales on intuition describe an affective type of decisions based on hunches (Scott, Bruce, 1995; Pacini, Epstein, 1999; Pretz et al 2014; Pachur, Sppar, 2015). In this study we enlarge this characteristics to an own dimension called Anticipation (Launer, XXX). The received information in this regard comes from outside the body (Sinclair, 2011, 2014). Many researchers try to explain atypical or paranormal decision making (Honorton, Ferrari, 1989), anticipation of solutions, e.g. presentiments of future emotions (Radin, 2004), precognition (conscious cognitive awareness), premonition (affective apprehension) according to Bem et al. (2015), extrasensory perception (ESP) by Thalbourne and Haraldsson (1980) paranormal belief and experiences (Lange, Thalbourne, 2002), or automatic evaluation (Ferguson, Zayas, 2009). In sports, the concept of anticipating future moves by people is also called heuristics (Grush, 2004; Williams, Ward, 2007; Schultz, 2013), however it rather belonmgs to the heuristic theory (Launer, XXX).

Unconscious Thoughts

In a study by Carlson (2008) based on the TIntS by Pretz and Totz (2007), he included the dimension incubation based on the theory by Dijksterhuis (2004). Decisions can not only be made fast but also after a period of time and (unconscious) reflection and activation (Bowers et al., 1990; Waroquier et al, 2010), incubation (Wallas, 1920; Shirley & Langan-Fox, 1996), unconscious thinking (Dijksterhuis and Nordgren (2006), distraction (Kohler, 1969), removal of blockages (Duncker, 1945), completion of schemes (Mayer, 1996), or in intuitive step-ups (Nicholson, 2000). Despite the many critics on the quality of the decision (González-Vallejo et al., 2008; Srinivasan et al, 2013; Newell & Shanks, 2014; Čavojová, Mikušková, 2014; Abbott, 2015; Nieuwenstein et al., 2015) slow decision-making is the usual process in management (Pachur & Aebi Forrer, 2013).

New Dimension Technology based Decisions

Rosak and Launer (2023) describe in their presentation and short paper the decision-making based on new technologies. Today, decision-making is more and more performed using Artificial Intelligence.

Modern technology has significantly transformed decision-making in companies, including the IT industry (Selart et al., 2008). Intuitive decision-making has shifted towards a more data-driven approach, though research on intuition and IT remains limited due to challenges in defining and measuring intuition (Ramrathan & Sibanda, 2017). IT investment decisions are

often riskier than other capital investments, making decision-making a key managerial task (Kusumawati & Subriadi, 2019). Since the 1960s, decision support systems (DSS) have evolved, with modern technologies like dashboards and web tools enhancing decision-making by offering advanced functionalities such as data analysis, modeling, and collaboration (Bhargava et al., 2007). Despite these advances, early-stage technology-based service innovations still face high failure rates (van Riel et al., 2011).

Businesses are increasingly adapting their processes, structures, and models due to rapid advancements in digital technologies (Kraus et al., 2021). This technology revolution has made modern tech essential in daily operations, strategies, and decision-making. Intuitive decision-making is now shifting to a more data-driven approach, especially in the IT industry (Selart et al., 2008). However, research on intuition and technology remains limited, partly due to challenges in defining and measuring intuition (Ramrathan & Sibanda, 2017). IT investment decisions carry higher risks than other capital investments, making decision-making a critical aspect of management (Kusumawati & Subriadi, 2019).

PRISMA Literature Search

In the future, a systematic PRISMA-nabsed literatutre study will be added to this paper.

Integrated, multi-dimensional and multi-disciplinary Framework

When combing all approaches on how to measure intuition in an integrated, multi-dimensional and multi-disciplinary framework, a rather broad definition on intuition is needed. Intuition seems to be an unconscious, spontaneous inferential or slow decision making process based on holistic abstract or big picture (Holistic), experience-learned heuristics, affective and emotional feelings and body impulses, decision based on technologyperception without awareness, environmental influences by people as well as the capability for pre-cognition based on hunches (Launer et al., 2020).

Analysis of Intuition Dimensions		Scale Development Studies								Unconscious Thoughts	Theory on Personality (Book)	Para-Psychology		Literature Study
		Scott & Bruce	Pacini & Epstein	Burns & D`Zurilla	Cools & van den Broek	Pretz & Totz / Carlson	Betsch	Pachur & Spaar	Launer & Cetin	Dijksterhuis	Epstein	Bem	Thalbourne & Haraldsson	Khan & Launer
		1995	1999	1999	2007	2007/2008 (2014)	2014	2015	2023	2004	2003	2011/2015	1980	2024
		GDMS	REI	PMPI	CoSI	TIntS	PID	USID	RIDMS	UTT	CEST	Precognition	ASGS	
Rational Decision Making or deliberation in general			Rational analytical	Rational Processing			Deliberation				Rational, verbal reasoning			
	Analytics (search & evaluation)	Rational (Search & Evaluation) = analytical							Analytical Style					**Analytical Style**
	Planning				Cognitive Styles (Knowing)				Knowing Style					**Knowing Style**
	Knowing				Cognitive Styles (Planning)			Rational (Planning & Knowing Style)	Planning Style					**Planning Style**
Holistic, uncritical perception and unconscious intuition			Thinking in abstract terms			Holistic abstract and holistic big picture			Holistic Big Pictutre					**Holistic Big Pictutre**
	Holistic Abstract													
	Holistic Big Picture													
Fast Decisions														
	Spontaneous decisions intuition	Spontaneous		Automated Processing				Spontaneous	Spontaneous					**Spontaneous**
	Experienced based inferential or heuristical Intuition			Automated Processing		Inferential			Experience-based heuristically		Experiental (**Learning** facts and emotions)			**Experience-based heuristically**
Emotional affective decisions (gut, heart and skin feeling as well as somatic markers)			Experiential	Emotional processing		Affective	Affective	Affective	Emitional Style					**Emitional Style**
	Feelings & Emotions	Intuitive incl. Feelings & hunches	Experiental = feeling)	Emotional (Feelings, Gut feeling)		Heart	Affective (Feelings)	Feelings /Gut & Heart	Body Impulses					**Body Impulses**
	Mood													
	Anticipation, presentiments, pre-cognition and pre-monition		Experiential (Hunches)			Emotional hunches			Anticipation			Precognition	extrasensory perception (ESP), psychokinesis (PK), and life after death (LAD).	**Anticipation**
Support from others or environmental influences		Dependent	Experiential by feeling a person is wrong or right						Support by Colleagues					**Support by Colleagues**
Slow unconscious thinking, Incubation or Unconscious Thoughts						Incubation (Carlson)			Slow Unconscious Thoughts	Unconscious Thoughts Theory				**Slow Unconscious Thoughts**
Not used dimension in our study		Avoidant												**Avoidant**
					Creating									**Creating**
														Technology-based

Implications

Launer, Svenson, and Cetin developed 12 dimensions to measure rational and intuitive decision-making across various fields. Their framework includes categories such as Rational (Analytic, Planning, Knowing), Holistic (Abstract, Big Picture), Fast (Spontaneous, Heuristic), Slow (Incubation), Emotional decisions, and a new dimension, Anticipation (hunches). These dimensions offer a comprehensive and independent approach to understanding decision-making.

Their findings show that the rational decision types (planning, knowing, and analytical) correlate with each other, while affective intuition (emotions, body impulses, mood) forms a distinct, closely related group. The often vague "gut feeling" is now better defined, with anticipation emerging as a new dimension of intuition. The study also clarifies that fast and slow unconscious decision-making are distinct forms of intuition, and decisions influenced by others now have greater clarity as a factor of intuition.

Limitations and future research

The RIEHUAD approach has several limitations, necessitating caution when interpreting its findings. These limitations include reliance on self-report measures for evaluating validity (Burns & D'Zurilla, 1999; Hodgkinson & Sadler-Smith, 2011) and the lack of a process-based description of decision-making (Topolinski, 2011). The model overlooks contextual and environmental factors influencing intuition (Elsbach & Barr, 1999) and fails to address instinctual dimensions (Sun & Wilson, 2014). Additionally, interpersonal intuition, particularly in teaching and communication settings, remains underexplored, with "teacher intuition" as a potential new dimension (Akinbode, 2013).

The study does not consider wise decision-making, a blend of rational and intuitive choices (Sadler-Smith, 2012), nor does it assess the success or quality of decisions, as both rational and intuitive decisions can be imperfect or ambiguous (Watkins, 1970; Burke & Miller, 1999). Furthermore, the study does not examine decision speed or frequency, nor how much information is typically gathered before decisions are made. While the questionnaire measured participant preferences, some dimensions still require deeper testing through qualitative experiments.

Conclusion

This study introduces an Integrated multidisciplinary multidimensional framework based on existing, widely accepted studies and empirical studies. They provide a comprehensive collection of all dimensions for rational and intuitive decision-making and four additional dimensions for the emotional decision-making style. It is usable for all kind of decision-making in the broad research field. In the future, a PRISMA-based systematic literature study will be added to the paper.

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Latest research on the Human Gut Microbiome and the ENS System

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Abstract

The research in the gut-brain axis has advanced in recent years. The historic research on the ENS system has been modernized in medical science. The historic scientific breakthrough in understanding the interaction of the nervous system with the digestive system occurred with the discovery of the so-called enteric nervous system (ENS) in the mid-nineteenth century Jahrhunderts. This study is a mixed method research about the gut brain-axis and intuitive decision-making. Three methods will be mixed: 1) systematic literature study, 2) qualitative interviews with the identified scientists, and 3) a quantitative study on intuition in a cross-cultural study based on the results of .Launer& Svenson, 2022 (RHIA) and Launer & Cetin, 2023 (RIDMS). This extended abstract shows the theory so far and gives an outlook on the methodology used. As a result, the knowledge will give a deeper knowledge about thze gut-brain-axis and intuitive decision-making

Introduction

The notion of a "gut feeling" is deeply rooted in traditional beliefs, despite lacking scientific evidence. This idea revolves around an instinctive sense or intuition when making decisions. The concept dates back to ancient times when the stomach was considered the primary organ responsible for intuitive choices. Over time, this idea evolved into the phrase "gut feeling," which is now associated with interoception—the biological process where internal organ functions influence the brain. Our actions are shaped not only by external factors but also by internal signals. The gut plays a pivotal role in this process, serving as the central hub for complex interactions between our genes and the immune system's external impact on the body, making it a key organ in environmental communication (Brandtzaeg, 2011).

The enteric nervous system (ENS), often referred to as the gut's autonomous nervous system, has captivated scientists for over a century. True to its name, it operates autonomously, managing complex tasks and regulating essential functions independently of external input. Simultaneously, the ENS receives and processes a barrage of signals from various cells within the gut wall and lumen, integrating these inputs (Annahazi & Schemann, 2020). Despite remarkable scientific advancements in recent years that have deepened our understanding of the communication between microbes and their hosts, the fundamental mechanisms behind the microbiota-gut-brain connection remain elusive (Silva, Bernardi & Frozza, 2020).

Medical Theory

Human Gut Microbiome

Our knowledge of species and functional composition of the human gut microbiome is rapidly increasing, but it is still based on very few cohorts and little is known about variation across the world (Arumugam et al., (2011). However, the main stream of medical research is in regards to bowel disease (Greenblum et al., 2012), the selective entry of nutrients (digestion) the immune system (Barbarosa & Resigno, 2010), aging (Rampelli et al., 2023), metabolic programming (Mischke & Plösch, 2013) as well as its role in obesity and insulin resistance (Lee, Sears & Maruthur, 2020). Tan (2023) describes the microbiota-gut-brain axis in stress and depression. Frontiers in Neuroscience, 17, 1151478. But, human individual is best described as a super-individual in which a large number of different species (including Homo sapiens) coexist. Fasano and Flaherty, (2022) describe the gut feelings and the microbiome in relation to our health.

The primary function of the intestine is to absorb nutrients and water from the external environment. To ensure that the body receives the necessary energy and essential nutrients, it first requires the secretion of various digestive enzymes and functional components, such as bile acids. This crucial exchange with the environment leads to the intestine's unique role as a semipermeable barrier, distinct from other body surfaces like the skin. The intestinal mucosa acts as a highly selective barrier, permitting the absorption of specific luminal substances (nutrients) through active transport or passive diffusion while effectively blocking the entry of harmful agents such as viruses, bacteria, and parasites (Haller & Hörmannsperger, 2013).

In an adult human, the gut epithelium spans an estimated surface area of about 300 m² when considering the villi, microvilli, crypts, and folds. Although this barrier consists of only a single cell layer, making it inherently fragile, it is safeguarded by a range of chemical and physical innate defense mechanisms that work closely with the local adaptive immune system (Brandtzaeg, 2009a). The healthy gut is home to an immense population of beneficial bacteria, or "symbionts," which outnumber the body's cells by about tenfold, comprising an estimated 10^{13} to 10^{14} microbial cells with a total weight of 1–2 kilograms (Neish, 2009). Numerous genes govern both the innate and adaptive branches of the immune system. Over time, human immunogenetics have evolved to detect and respond to "danger," shaped by the challenges of a "dirty environment," even long after the hunter-gatherer era. Throughout this evolutionary journey, the intestinal immune system has developed two adaptive anti-inflammatory strategies: immune exclusion, facilitated by SIgA, to control microbial colonization on surfaces and prevent the mucosal penetration of potentially harmful agents; and oral tolerance (Brandtzaeg, 2011b).

Hooper et al. (2001) report findings that demonstrate how this commensal bacterium influences the expression of genes associated with several critical intestinal functions, such as nutrient absorption, strengthening the mucosal barrier, xenobiotic metabolism, angiogenesis, and postnatal intestinal

development. These results underscore the fundamental importance of the interactions between resident microorganisms and their hosts (Hooper et al., 2001).

The idea that the gut and brain are intricately connected, influencing not only gastrointestinal function but also emotional states and intuitive decision-making, is deeply embedded in our language. Recent neurobiological research into this gut-brain interaction has uncovered a complex, bidirectional communication system. This system plays a crucial role in maintaining gastrointestinal homeostasis and digestion and likely impacts emotions, motivation, and higher cognitive functions, such as intuitive decision-making. Moreover, disruptions in this communication network have been linked to various disorders, including functional and inflammatory gastrointestinal issues, obesity, and eating disorders (Mayer, 2011; Pandey et al., 2017; Launer et al., 2020).

The ENS System

Decades of work in animal models have demonstrated that the enteric nervous system (ENS) plays a key role in controlling gut functions. Recent advances made it possible to extend such studies to the ENS of man in health and even in disease. (Schemann & Neunlist, 2004; Schemann et al., 2002). Our body is building a brain in the gut. Goldstein, Hofstra, & Burns (2013) describe the development of the enteric nervous system (Baron et al, 2022).

The enteric nervous system (ENS), which forms the intrinsic neural network of the gastrointestinal tract, comprises various types of neurons and glial cells. These are organized within two intramuscular plexuses that run throughout the entire length of the gut, regulating coordinated smooth muscle contractions and other essential gut functions (Sasselli, Pachnis, & Burns, 2012).

The enteric nervous system (ENS) is the largest and most complex division of the peripheral and autonomic nervous systems (PNS and ANS) in vertebrates. It comprises a vast array of neurons—comparable in number to those in the spinal cord—and features a variety of neurotransmitters and neuromodulators similar to those in the central nervous system (CNS). The ENS is organized into an interconnected network of neurons and glial cells, grouped into ganglia within two major plexuses (Sasselli, Pachnis & Burns, 2012). These components create an integrated circuitry that governs intestinal motility, fluid exchange across the mucosal surface, blood flow, and the secretion of gut hormones. While the gut also receives extrinsic parasympathetic and sympathetic innervation, the intrinsic neuronal circuits of the ENS are capable of generating reflexive gut contractile activity independently of CNS input (Sasselli, Pachnis & Burns, 2012).

The neural crest origin of the enteric nervous system (ENS) was first demonstrated by Yntema and Hammond, who found that when the vagal (hindbrain) region of the neural crest was ablated in avian embryos, enteric ganglia did not develop along the gastrointestinal tract (Yntema and Hammond, 1954). This finding was later confirmed and expanded through studies using isotopic and isochronic grafts of quail pre-migratory neural crest cells into chick embryos (Le Douarin, 1973).

Basal Ganglia

The basal ganglia play a crucial role in an attentional mechanism that helps connect sensory input to motor output in the executive forebrain. This focused attention creates an automatic link between voluntary effort, sensory input, and the activation of sequences of motor programs or thoughts (Brown & Marsden, 1998; Haber & Gdowski, 2005; Mink, 2003; Smith, Bevan, Shink & Bolam, 1998). As a major neural system, the basal ganglia receive inputs from various cortical areas, process this information, and relay it back to the cortex through connections in the midbrain and thalamus. Although inputs to the basal ganglia originate from multiple cortical regions, including the frontal, parietal, temporal, and limbic cortices, the feedback from the thalamus is primarily directed toward frontal cortical areas, such as the prefrontal, premotor, and supplementary motor areas. This thalamic feedback, similar to the cerebellar connections that ascend through the thalamus to the primary motor cortex, integrates the basal ganglia into motor function (Gerfen & Wilson, 1996; Heimer & Heimer, 1983).

Interoception

Contrary to the processing of external cues, such as hearing, touch, smell, and sight, interoception is the capability of the inner body state. It involves afferent pathways that manage internal physiological functions (Tsakiris & Critchley, 2016). Research indicates that primates have a specialized cortical area for homeostatic afferent activity, which mirrors the body's overall physiological condition.

This interoceptive system, connected to autonomic motor control, contrasts with the exteroceptive system, which directs somatic motor functions. The primary interoceptive representation located in the dorsal posterior insula generates specific and clear bodily sensations, such as pain, temperature, itch, sensual touch, muscular and visceral sensations, vasomotor activity, hunger, thirst, and breathlessness. In humans, this initial interoceptive activity is further processed in the right anterior insula, forming a meta-representation that underpins self-awareness and emotional consciousness (Craig, 2003).

Interoception impacts more than homeostatic and allostatic reflexes; it is essential for motivation, emotion, social cognition, and self-awareness. From early development, the ongoing integration of biological data from the body establishes the foundation for conscious awareness and the subjective sense of being a distinct individual (Tsakiris & Critchley, 2016).

Stomach and Colon Feeling (bacteria)

The gut-brain connection

The gut-brain connection involves complex cross-communication through multiple biological networks, including the neural network, neuroendocrine system, immune system, and metabolic pathways, facilitating bidirectional communication between the brain and gut (Gwak & Chang, 2021; Ma et al., 2019). Alterations in gut microbiota can impact brain physiology and cognitive functions

(Morais, Schreiber & Mazmanian, 2021). There is increasing recognition of the gut microbiota's role in modulating various neurochemical pathways via the highly interconnected gut-brain axis (Silva, Bernardi & Frozza, 2020; Morais, Schreiber & Mazmanian, 2021).

Neurobiological research into gut-brain communication has uncovered a complex, bidirectional system that not only ensures the maintenance of gastrointestinal homeostasis and digestion but also influences affect, motivation, and higher cognitive functions (Mayer, 2011). The sympathetic and parasympathetic nervous systems modulate intestinal functions, potentially mediating the emotion-related changes in motor, secretory, and possibly immune activities within the gastrointestinal tract. Sensory information in the gut is encoded through three primary mechanisms: by primary afferent neurons, immune cells, and enteroendocrine cells. Both extrinsic and intrinsic primary afferents contribute to multiple reflex loops designed to optimize gut function and preserve gastrointestinal homeostasis during internal disturbances (Mayer, 2011).

Sylvia et al. (2020) indicate that the mechanisms by which short-chain fatty acids (SCFAs) might affect brain physiology and behavior are not yet fully understood. Enteroendocrine cells (EECs), specialized epithelial cells derived from the endoderm, are dispersed throughout the gastrointestinal (GI) tract (Dalile, Van Oudenhove, Vervliet & Verbeke, 2019). These cells constitute the body's largest endocrine organ and are crucial in regulating GI secretion and motility, controlling food intake, and managing postprandial glucose levels and metabolism. EECs detect luminal content and release signaling molecules that can enter the bloodstream to function as hormones on distant targets, act locally on neighboring cells, or engage distinct neuronal pathways, including those involving enteric and extrinsic neurons (Latorre et al., 2016).

The saprophytic gut microbial flora plays a crucial role in modulating the gut-brain communication pathway, now recognized as the "microbiota-gut-brain axis." The gut microbiota is essential for maintaining homeostasis at local, systemic, and brain levels. Numerous neuroactive molecules, hormones, and metabolites facilitate this bidirectional communication, enabling cross-talk between the gut and brain (Bistoletti, Bosi, Banfi, Giaroni, & Baj, 2020). The dorsal vagal complex in the brainstem of the central nervous system (CNS) organizes vagovagal reflexes and establishes connections between the CNS and the gut. This complex effectively links the "CNS brain" with the "ENS brain," creating a brain-gut connectome that provides reflexive adjustments to optimize digestion and nutrient and fluid assimilation (Powley, 2021).

The connection between the gut environment and the brain can significantly influence host mood and behavior. While the link between gut microbiota and the brain has been recognized for some time, recent studies have begun to uncover the mechanisms by which gut microbiota and the integrity of the gut barrier impact brain function and behavior (Gwak & Chang, 2021). This interaction between the microbiota and the gut-brain axis (GBA) is bidirectional, involving communication from gut microbiota to the brain and vice versa, mediated through neural, endocrine, immune, and humoral pathways (Carabotti, Scirocco, Maselli & Severi, 2015; Ma et al., 2019).

Microglia, the brain's resident immune cells, play a critical role in modulating neurogenesis, influencing synaptic remodeling, and regulating neuroinflammation by constantly monitoring the brain's microenvironment. Dysfunction in microglial activity has been linked to the onset and progression of various neurodevelopmental and neurodegenerative diseases. However, the complex array of factors and signals that influence microglial behavior remains to be fully understood (Abdel-Haq, Schlachetzki, Glass & Mazmanian, 2019).

Akyildiz et al. (2019) explore minimally invasive, heterogeneous, and externally accessible electrical and molecular communication channels to transmit information between devices through the Microbiome-Gut-Brain Axis (MGBA), which includes the gut microbial community, gut tissues, and the enteric nervous system. Gut microorganisms can activate the vagus nerve, a process that plays a crucial role in influencing brain function and behavior. The vagus nerve appears to distinguish between non-pathogenic and potentially pathogenic bacteria, even in the absence of noticeable inflammation, and vagal pathways can mediate signals that lead to either anxiogenic or anxiolytic effects, depending on the nature of the stimulus (Forsythe, Bienenstock & Kunze, 2014).

Orexin-A is a key chemical mediator in the gut-brain axis, with hypothalamic orexin-A influencing gastrointestinal motility and secretion, while peripheral orexin in the intestinal mucosa can affect brain functions, potentially forming an orexinergic gut-brain network. Orexin-A is thought to regulate nutritional processes, including short-term food intake, gastric acid secretion, and motor activity during the cephalic phase of feeding. Additionally, orexin-A is linked to stress systems and responses, particularly through its interaction with the hypothalamic-pituitary-adrenal (HPA) axis (Mediavilla, 2020).

Skin Feeling

Interoception and Skin Feeling

The C-tactile(CT) afferents in hairy skin, which respond to the slightest of touch like cares, have attracted attention in the literature. This is skin-mediated interoceptive processes similar to pain and tactile pleasures (Crucianelli & Morrison, 2023). In order to investigate the brain underpinnings of mindfulness, touch, and interoception, Casals-Gutierrez & Abbey's research (2020) studied MRI operations researches to thoroughly understand the underpinnings of brain's interoception, touch, and mindfulness which revealed that there may be some possible regions where these modalities interconnect. Skin-mediated signals like pain, temperature, and affective touch have been redefined as interoceptive (Crucianelli & Ehrsson, 2023). Neurophysiology and functional neuroimaging suggest that social, affective touch is a prominent category of tangible experience, operating mainly in social interactions and relationships, and playing a role in physiological regulation during stress and challenges (Morrison, 2016).

Touch can safeguard detrimental physiological effects of maladaptive reactions. Inter-individual touch can sack negative affect while evoking strong moods of pleasure, though context and internal state can alter the hedonic value of touch (Ellingsen et al., 2016). While hostile somatosensations

remain well-characterized in terms of peripheral signaling, pleasant tactile sensations may be mediated by specialized peripheral tactile afferents like C-tactile fibers, which respond to light and slow stroking and are related only in hairy skin (Vallbo et al., 1999; Löken et al., 2009; Zaman et al., 2020). Soviet studies of interoceptive conditioning found it to be unconscious, slower to establish, and more resistant to extinction than exteroceptive conditioning (Uno, 1970).

Interoception and Heartbeat

Individuals with having clearer perception of heart activity exhibit superior levels of momentary emotional experiences, such as anxiety, and score higher on traits like emotional capability. This facet of cardiac consciousness focuses on heartbeat perception (Schandry, 1981). Non-invasive measures of heartbeat detection accuracy are frequently used to index interoceptive sensitivity (Brener & Ring, 2016). Interoception focusing on heart has received certain attention owing its role in decision-making, clinical disorders and emotional experience like depression and anxiety (Schulz, 2016). Schulz's meta-analysis revealed an extensive network linked to heart-focused interoceptive attentiveness, which includes the posterior insula, precentral gyrus, right claustrum, and medial frontal gyrus.

The right-hemispheric dominance highlights the processing of non-verbal information, with the posterior insula serving as the primary gateway for cardioception. Increased heart-focused interoceptive accuracy correlates with heightened emotional intensity, improved memory, and more adaptive decision-making (Garfinkel et al., 2013; Werner et al., 2009).

Paulus & Stein (2010) suggested that interoception essentially cause anxiety and mood disrders. The claim has been strengthened by the work of (Domschke et al., 2010) who related anxiety disorders to interoception whereas Wiebking et al. (2010) termed depression the outcome of lack of interoception. Interoceptive signals can be harmful, and confusing for those people who are under panic disorders, adding to their difficulties to make intuitive decisions (Wölk et al., 2014).

Anticipation - Information from outside the body

Paranormal Beliefs

Research has shown a positive link between belief in the paranormal and various psychopathological outcomes, including higher rates of psychiatric disorders, depression, and manic symptoms (Thalbourne and Storm, 2019; Liu et al., 2021; Dag, 1999; Peltzer, 2002; Thalbourne and French, 1995). The "psychodynamic functions hypothesis" (Irwin, 2009) suggests that these beliefs help impose order on a chaotic world, alleviating uncertainty by providing meaning or an illusion of control (Irwin, 1993, 2003, 2009). This process involves "magical ideation," defined as "belief in forms of causation that by conventional standards are invalid" (Eckblad and Chapman, 1983, p. 215), often serving as a coping mechanism for those who feel powerless (Ofori et al., 2017; Drinkwater et al., 2019). McGarry and Newberry (1981) noted that individuals with paranormal beliefs tend to see the world as unjust and unpredictable (Roe and Bell, 2016; Stone, 2016).

While paranormal beliefs might offer a sense of control and adaptive benefits in certain situations (Schumaker, 1987; Dean et al., 2021; Parra and Giudici, 2022), they are generally associated with poorer psychological functioning and increased distress. Despite this, paranormal beliefs are widespread in non-clinical populations, as a 2005 Gallup poll found that three-quarters of Americans held at least one paranormal belief (Moore, 2005; Irwin et al., 2012a). In general populations, these beliefs are usually benign unless combined with cognitive distortions, which can influence how individuals interpret their experiences (Irwin et al., 2012a,b; Drinkwater et al., 2021). This perspective suggests that supernatural beliefs reflect rather than determine mental states, impacting well-being indirectly through cognitive-perceptual factors (Irwin, Dagnall & Drinkwater, 2013).

Radin, a senior scientist at the Institute of Noetic Sciences, demonstrated the ability to anticipate future events through physiological responses such as skin resistance and pupil dilation (Radin, 2004a; Radin & Borges, 2009). Meta-studies, examining up to 90 experiments, confirm these effects, showing that individuals' responses can be influenced by future stimuli, a phenomenon known as precognition (Bem, 2011; Bem et al., 2015; Mossbridge et al., 2014, 2015). Humans constantly and automatically evaluate their environment, which can trigger adaptive responses (Ferguson & Zayas, 2009).

Psi phenomena, including ESP, telepathy, clairvoyance, and precognition, can function without conscious awareness, facilitating adaptive outcomes (May & Marwaha, 2015). The "Psi-mediated Instrumental response" (PMIr) model predicts that psi operates unconsciously to trigger preexisting behaviors in response to environmental opportunities or threats (Hitchman, 2012; Hitchman, Roe, Sherwood, 2012a, 2012b).

Recent studies suggest that paranormal belief helps individuals cope with stress and is linked to higher emotional intelligence (EI) (Irwin, 1992; Dudley, 2002). Rogers et al. (2006) explored how coping strategies predict, and EI moderates, belief in the paranormal. A study by Rattet and Bursik (2001) found that while extraversion and intuition are linked to precognitive experiences, paranormal beliefs are more associated with dissociative tendencies.

Anticipation, though underexplored in business and psychology, is a key concept in sports psychology, as seen in research on soccer goalkeepers (Schulz, 2013). Meta-analyses show that anticipation of future events is possible and can influence behavior, as demonstrated by retroactive avoidance of negative stimuli (Bem, Tressoldi, Rabeyron & Duggan, 2016; Roe, Grierson & Lomas, 2012; Maier et al., 2014). Poli (2017) emphasized anticipation as a valid research topic, exploring how systems use future information in decision-making processes. Anticipation, categorized into explicit (conscious) and implicit (unconscious) forms, plays a crucial role in understanding anticipatory behavior and its potential risks and benefits (Poli, 2017; Adams et al., 2009; Miller, 2018). Self-referential cycles in anticipatory systems are distinguished as either incomplete or complete, with incomplete systems requiring external interpretation (Poli, 2018).

Conclusion

The extended abstract shows the latest literature on the gut-brain-axis and intuitive decision-making. It describes the methodology used for a deeper study.

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Literature Study on the Avoidance of Decision-Making

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Extended Abstract

Introduction

The decision-making styles study by Scott and Bruce (1995) is the only tool that includes the avoidance of decision-making. They outlined four decision styles based on previous theories and research, defining them behaviorally: (a) the rational style involves a comprehensive search and logical evaluation of alternatives, (b) the intuitive style relies on instincts and emotions, (c) the dependent style seeks advice and guidance from others, and (d) the avoidant style tries to evade making decisions.

Their research showed a negative correlation between rational and avoidant decision-making styles in both military officers and students, aligning with Phillips et al. (1984), who concluded that rational decision-makers tend to face problems rather than avoid them. However, unlike Phillips et al.'s (1984) finding that dependent decision-makers were just as likely to avoid problems as rational or intuitive ones, this study found that dependent decision-makers were more inclined to avoid decisions, supporting Harren's (1979) view that dependent decision-makers tend to be passive and avoidant.

The avoidance of decisions as a decision-making style is lacking attention in the field if decision-making (Launer & Cetin, 2023). This extended abstract / short paper describes this decision-making style in detail.

Theoretical Foundation based on existing Studies

Decision Avoidance Result from Reason and Emotion.

Multiple research studies have explored why individuals often avoid making decisions by delaying action, failing to act, or sticking to the status quo. This review connects findings from various fields and identifies four key decision avoidance effects: choice deferral, status quo bias, omission bias, and inaction inertia. These effects are explained through a rational-emotional model, which highlights factors that lead to decision avoidance. Key elements of this model include cost-benefit analysis, anticipated regret, and difficulty in selecting an option. Additional factors influencing decision avoidance, such as negative emotions, decision strategies, counterfactual thinking, and preference uncertainty, are also discussed.

Avoidance and Decision Making in Anxiety

While the intense dread and apprehension associated with severe anxiety can cause significant personal distress, it is often the excessive avoidance behaviors that lead to the greatest impairment. These behaviors prevent individuals from engaging in social activities, walking in public, or addressing their emotions. Similarly, in obsessive-compulsive disorder, the distress caused by obsessions is compounded by avoidance behaviors like checking, rituals, and compulsions, which interfere with normal life. Additionally, while fear itself is not typically life-threatening, avoidance can be—such as when fear of flying leads to driving long distances (despite flying being safer) or when avoiding painful thoughts results in harmful drinking (Beckers & Craske, 2017).

Despite the central role of avoidance in anxiety and other clinical conditions, its study has not consistently garnered attention throughout the history of psychological science. Although avoidance learning was a key focus during the behaviorist era, interest significantly declined with the rise of cognitive psychology, leading to decades of limited theoretical progress in understanding avoidance, despite its recognized importance in clinical psychology. However, in recent years, there has been a resurgence of interest in avoidance behavior, with a significant increase in empirical and theoretical research over the past decade (Krypotos et al., 2015). This revival has brought more sophisticated theoretical analyses and a deeper understanding of both the behavioral and neurobiological aspects of avoidance in both normal and clinical contexts (Krypotos et al., 2015; LeDoux et al., 2017; Beckers & Craske, 2017).

The decline in interest in avoidance research may be partly due to the complex relationship between fear and avoidance. Early theories, such as Mowrer's (1951), emphasized the role of fear in the development and persistence of avoidance. However, more recent conceptual and empirical findings have challenged this, showing that fear and avoidance do not always align. Fear can occur without avoidance, and avoidance can take place without visible fear. Consequently, fear learning research has often focused on other areas, like Pavlovian conditioning. Nonetheless, avoidance remains central to the impact of clinical anxiety, and understanding its nature and the decision-making processes behind it is essential for improving clinical interventions (Beckers & Craske, 2017).

Recent theories have expanded on Mowrer's two-factor theory, highlighting the role of threat expectations (Lovibond et al., 2008), occasion setting (De Houwer et al., 2005), Pavlovian influences (Krypotos et al., 2014), and habit formation (LeDoux et al., 2017) in shaping avoidance behavior. These developments help clarify the connections and distinctions between fear, defensive responses, and avoidance. The articles in this special issue of *Behaviour Research and Therapy* offer a comprehensive overview of current research on avoidance and suggest future directions for both basic science and clinical applications concerning avoidance behavior and decision-making in anxiety (Beckers & Craske, 2017).

In their opening article, Arnaudova et al. (2017) explore various pathways through which avoidance can escalate into excessive behavior, commonly seen in anxiety and related disorders. Drawing on findings from animal studies and experimental cognitive psychology, they discuss mechanisms that

contribute to excessive avoidance and propose potential clinical interventions to help reduce it. In another review, Kirlic et al. (2017) suggest that the key to understanding avoidance behavior lies not just in avoidance tendencies but in the conflict between approach and avoidance drives, along with the resulting dysregulated decision-making. They present basic animal paradigms and their human adaptations to study this conflict, highlighting the underlying neurobiological mechanisms. Treanor and Barry (2017) offer a compelling theoretical analysis of how avoidance behavior is sustained through associative fear learning and extinction. They emphasize the different roles avoidance can play and suggest behavioral and pharmacological strategies, particularly in combination with exposure therapy, to address avoidance in clinical anxiety. These approaches warrant further investigation in future studies (Beckers & Craske, 2017).

The remaining papers in this special issue present empirical findings that offer new insights into the relationship between fear and avoidance. Echoing Kirlic et al. (2017), Rattel et al (2017) and Bublatzky et al. (2017) demonstrate that approach incentives can reduce avoidance behavior in the lab, whether avoidance stems from instructed threats or experientially acquired fears. These findings suggest that approach incentives may disrupt the cycle of avoidance, which typically blocks exposure to fear-reducing information and reinforces continued avoidance (Beckers & Craske, 2017).

Ng and Lovibond (2017) highlight the role of threat expectations in maintaining avoidance by showing that the intention to avoid is as effective as actual avoidance in reducing anticipatory arousal. This supports the expectancy theory of avoidance, which has gained prominence as a new theoretical framework (Lovibond et al., 2008; Krypotos et al., 2015).

Vervliet et al. (2017) offer an innovative perspective by proposing that feelings of relief reinforce avoidance behavior and that dysregulated relief processing may contribute to excessive, habit-like avoidance. Meanwhile, Xiu et al. [this issue] emphasize the importance of individual learning histories, showing that the persistence of avoidance during threat extinction depends on the initial reinforcement rate of avoidance (Beckers & Craske, 2017).

Finally, Hunt et al. (2017) provide evidence that individual differences in distress tolerance and coping strategies, such as suppression or distraction, influence when fear responses lead to deliberate avoidance, especially in response to generalized threats.

This refines a theoretical understanding of avoidance in anxiety and offer practical, testable suggestions for improving the clinical management of avoidance behaviors (Beckers & Craske, 2017).

Decision Making In Avoidance–Reward Conflict

Decision-making in humans is shaped by the anticipation of rewards and punishments, but how these two factors interact remains unclear. The Avoidance–Reward Conflict (ARC) Task is a novel paradigm designed to explore this interaction. It varies the level of reward and the likelihood of punishment within a single framework, making it applicable to both non-human primates (NHPs) and humans (Sierra-Mercado et al., 2025).

The ability to seek rewards while avoiding danger is a fundamental trait shared across species. Both animals and humans can learn to associate certain stimuli with either rewarding or aversive outcomes. Extensive research on the behavior and neurobiology of reward and fear in both animals and humans (Phelps and LeDoux 2005; Schultz 2006) suggests similarities in the brain circuits involved. Studies on non-human primates (NHPs) show that the amygdala is crucial for fear and avoidance learning (Weiskrantz 1956), a finding echoed in human neuroimaging, where the amygdala is activated during fear learning and exposure to negative stimuli (Irwin et al. 1996; LaBar et al. 1998). For reward processing, NHP studies indicate that neurons in the ventral striatum respond to expected and received rewards (Apicella et al. 1991a, b; Schultz et al. 1992), while similar findings in humans using PET and fMRI further confirm the ventral striatum's role in reward processing (Elliott et al. 2000; Delgado et al. 2000). Dopaminergic neurons in the midbrain, part of the basal ganglia, are also vital for reward processing in both NHPs (Mirenowicz and Schultz 1994) and humans (Drevets et al. 2001; Boileau et al. 2003). These findings demonstrate that NHPs are a valid model for studying the neuroanatomy and physiology underlying normal behaviors (Sierra-Mercado et al., 2025).

Decision-making in both animals and humans is shaped by the anticipation of reward and punishment. For instance, classic human experiments show that people often delay immediate rewards in favor of larger future rewards (Mischel and Metzner 1962), and that the likelihood of punishment influences choices (Mischel and Grusec 1967). Similar effects of reward magnitude (Schultz 2000, 2006) and threat risk (LeDoux 2012) have been observed in animals, indicating that both factors play a key role in guiding decisions. However, the neurobiology of reward and fear has mostly been studied separately. To better understand how these elements are integrated during decision-making, there is a need for paradigms that can be applied to both non-human primates (NHPs) and humans (Sierra-Mercado et al., 2025).

In the ARC task, both non-human primates (NHPs) and humans can differentiate between varying levels of reward and aversion. Interestingly, both species display a similar behavior: they overwhelmingly choose the reward when the risk of punishment is low. Regardless of whether the reward is small, medium, or large, the likelihood of selecting the reward exceeds 90% for both NHPs and humans when the punishment risk is minimal. However, as the risk of punishment rises (medium aversion), smaller rewards are more likely to be rejected in favor of a safer, punishment-free option (Sierra-Mercado et al., 2025).

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Roles of Uncertainty Avoidance and Long-versus Short-Term Orientation on Decision Making Style a Literature Study

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Abstract

This study examines how cultural dimensions, particularly uncertainty avoidance and long- versus short-term orientation, influence intuitive decision-making styles in a German sample. Drawing on theories from cross-cultural psychology and decision-making research, we explore the effects of these cultural values on rational, holistic, inferential, and emotional decision-making styles. Data were gathered from 491 German participants through a detailed survey measuring cultural values and decision-making preferences. Results show that high uncertainty avoidance is associated with a lower preference for holistic and emotional decision-making. Furthermore, a long-term orientation is positively linked to analytic decision-making, while a short-term orientation aligns with emotional and inferential decision-making. These findings highlight the role of cultural context in shaping decision-making approaches and provide valuable insights for improving decision-making effectiveness in multicultural settings. Practical implications for organizational practices and suggestions for future research are also discussed.

Keyword: Uncertainty avoidance, Long-term orientation, Short-term orientation, Decision making styles, Germany

Introduction Long- versus Short-term Orientation

Culture is defined as "the collective programming of the mind which distinguishes the members of one human group from another" (Hofstede, 1980, p. 25). Beyond individual traits, human dispositions and behaviors are shaped by the norms, beliefs, and values of their cultural context (Triandis, 1989). Additionally, cultural values influence not only behavior but also how individuals perceive themselves and their social environment (Triandis, 1989). While Hofstede's model is widely recognized, there are several other significant theories of culture, such as the GLOBE research project and Schwartz's framework (1994). The GLOBE study (House et al., 2004) provided valuable insights by measuring culture both in terms of respondents' values (the "should be" dimension) and their perceptions of how their culture addresses collective challenges (the "actually is" dimension).

According to Hassan et al. (2011), the marketing and management literature has been heavily debated about the structure of culture, its measurement, and its impact on behavior (e.g., Dwyer et

al., 2005; Kirkman and Shapiro, 2001; Kirkman et al., 2006; Riordan and Vandenberg, 1994; Zhang et al., 2008). Hofstede (1980) made a significant contribution to this field by developing a theory of culture that includes four dimensions and creating a method for measuring cultural orientation. This framework was later expanded to include a fifth dimension, now known as long-term orientation (LTO) (Hofstede, 2001).

There are numerous definitions and theoretical frameworks across disciplines that examine the influence of time (see Hirschman, 1987, for a comprehensive review). The two most notable approaches to understanding time perceptions are those developed by Hofstede (1980, 2001) and Hall (1959, 1983). Hall's framework distinguishes between polychronic time (a relationship-oriented perspective) and monochronic time (a unidimensional focus on a single aspect), and this concept has been further developed to encompass eight distinct types of time.

Many more researchers have researched the temporal frames using words like extended time horizon (Zellweger, 2007), long-term focus (Narver & Slater, 1990), long-term horizon (James, 1999), managing for the long run (Miller & Le Breton-Miller, 2005), and long-term orientation (LTO; Chrisman & Patel, 2012; Gomez-Mejia, Haynes, Nunez-Nickel, Jacobson, & Moyano-Fuentes, 2007; Zahra, Hayton, & Salvato, 2004).

Introduction Uncertainty Avoidance

Uncertainty is a crucial contextual factor influencing the decision-making processes of multinational corporations across various types of international operations. According to Sniazhko (2019), the diverse ways in which uncertainty has been defined and analyzed in the international business literature have led to a fragmented understanding of multinational corporations behavior and the impact of uncertainty on international decision-making. Taking a broad perspective on uncertainty, he conducts a systematic review of the literature to explore how uncertainty is addressed in international decision-making and to suggest potential directions for future research. He identifies 13 dimensions of uncertainty and eight approaches to managing it (Sniazhko, 2019).

Lipshitz and Strauss (1997) explored three key questions in their research: How do decision-makers conceptualize uncertainty? How do decision-makers cope with uncertainty? Are there systematic relationships between various conceptualizations of uncertainty and the different strategies used to cope with it? The results revealed that decision-makers differentiate between three types of uncertainty: inadequate understanding, incomplete information, and undifferentiated alternatives (Lipshitz & Strauss, 1997). Based on their results and insights from earlier studies on naturalistic decision-making, they hypothesized that heuristic decision-making plays a crucial role. This approach outlines the strategies decision-makers use to address different types of uncertainty in real-world settings (Lipshitz and Strauss, 1997).

The interactions between Uncertainty Avoidance and Decision-making is extensive, however the differentiation in rational and intuitive decision-making is very limited. This needs to be better understood. In this paper we discuss these relationships and give suggestions on its measurement for empirical studies.

Long-term orientation

Venaik, Zhu and Brewer (2013) examined the use of the construct long-term orientation in the business and management literature.

Group	Author(s)	Year	Journal[a]	LTO measures[b]	Key results
1	Fang (2003)	2003	IJCCM	1	Conceptual and methodological critique of Hofstede LTO dimension, identifies fatal flaws in LTO measures, and calls into question the usefulness of Hofstede LTO for cross-cultural research
1	Spector et al. (2001)	2001	AP	1	Test psychometric properties of Hofstede measures using VSM94 (not the original LTO measures in the Chinese Values Survey) in 23 countries. Except LTO, all scales have poor reliability
1	Yeh and Lawrence (1995)	1995	JIBS	1	Argues how Hofstede LTO and collectivism dimensions are strongly related and therefore tap into the same underlying construct
2	Bearden et al. (2006) and Nevins et al. (2007)	2007	JBE	3a	High LTO on both tradition and planning dimensions has significant positive relationship with work ethic and personal ethical values
2	Buck et al. (2010)	2010	IBR	1	Chinese cultures (with high LTO) tend to adopt long-term HRM strategies in international joint ventures
2	Erumban and de Jong	2006	JWB	1	Countries with a low LTO score should have a higher rate of ICT adoption (hypothesis not supported)
2	Kaufmann and O'Neill	2007	JWB	1	LTO distance has a positive effect on selecting a joint venture with a marketing/supplier focus and a negative effect on selecting a joint venture with an innovation focus
2	Merkin (2004)	2004	AJC	1	LTO culture members are more likely to use harmonious and cooperative facework strategies than their short-term orientated counterparts
2	Sanyal and Guvenli (2009)	2009	CCM	1	LTO (STO) is associated with more (less) bribe giving
2	Tsui and Windsor (2001)	2001	JBE	1	LTO (STO) is consistent with low (high) ethical reasoning
2	Van Everdingen and Waarts (2003)	2003	ML	1	The higher the score on LTO, the higher the innovation adoption rate (ERP adoption rate) ($n = 10$ European countries)
3	Fu et al. (2004)	2004	JIBS	2v	High FO values strengthen the positive relationship between belief in fate control and perceived effectiveness of assertive strategies
3	Naor et al. (2010)	2010	JOM	2v (3bp for firm culture)	Controlling for organizational culture, national culture of high FO values has no effect on manufacturing performance. However, organizational culture of high FO practices has a significant positive effect on manufacturing performance
3	Seleim and Bontis (2009)	2009	JIC	2p, 2v	High scores on FO values (practices) are associated with high (low) corruption
4	Barkema and Vermeulen (1997)	1997	JIBS	3a	Differences in LTO between home and host countries (1) have a negative impact on international joint venture survival, and (2) reduce a firm's propensity to set up an international joint venture rather than a wholly-owned subsidiary
4	Bearden et al. (2006)	2006	JAMS	3a	8-item scale for two dimensions of LTO - tradition and planning
4	Hofstede and Minkov (2010)	2010	APBR	3c	Develop a new LTO-WVS index using WVS variables/data
4	Peterson et al. (2002)	2002	JWB	3c	Western European MNCs place equally high priority on both long- and short-term performance measures compared to Japanese and US MNCs; Japanese and US MNCs are not statistically different in their long- or short-term performance measures
4	Ryu and Cook (2005)	2005	JABR	3a,3bp	Firms in high LTO culture prefer soft contracts with supply chain members

Notes: The list is sorted by group followed by author's name; [a]AJC – Atlantic Journal of Communication, AP – Applied Psychology: An International Review, APBR – Asia Pacific Business Review, CCM – Cross Cultural Management, IBR – International Business Review, IJCCM – International Journal of Cross Cultural Management, JABR – Journal of Applied Business Research, JAMS – Journal of the Academy of Marketing Science, JBE – Journal of Business Ethics, JBR – Journal of Business Research, JIBS – Journal of International Business Studies, JIC – Journal of Intellectual Capital, JOM – Journal of Operations Management, JWB – Journal of World Business, ML – Marketing Letters; [b]LTO measures: 1 – Hofstede LTO scores/scales; 2p,2v – GLOBE FO scores/scales (p-practices, v-values); 3a – author's scales adapted from Hofstede LTO; 3bp, 3bv – author's scales adapted from GLOBE FO (p-practices, v-values); 3c – author's scales

Table I.
Literature review on
Hofstede LTO and
GLOBE FO

Long-term orientation by Hofstede

The dimension of long- versus short-term orientation, initially identified by Bond in a study involving students from 23 countries, was later incorporated by Hofstede as the fifth dimension of national cultures (Hofstede, 1991; Hofstede & Minkov, 2010).

Hofstede's (2001) Long-Term Orientation (LTO) dimension was initially identified in the Chinese Culture Connection (1987) study, which was conducted in response to concerns that cultural questionnaires typically created by Western scholars might be biased by a Western perspective. To address this, a survey was specifically designed to identify and measure Chinese cultural values (and their corresponding dimensions) across various countries. While three of the resulting dimensions aligned with those in Hofstede's original survey, one dimension, termed Confucian Work Dynamism, did not match any in Hofstede's framework. Consequently, it was added as a new dimension to his model. Hofstede later decided to rename this dimension to Long-Term Orientation (LTO) for various reasons (Venaik, Zhu, & Brewer, 2013).

Hofstede (2001) distinguished between short-term orientation and LTO at the national level.

Hofstede's measurement of cultural values has faced criticism from several researchers due to its lack of robust psychometric properties (Spector et al., 2001), assumptions of unidimensionality (Bearden et al., 2006b; Gouveia et al., 2003), and its applicability at the individual level (Bearden et al., 2006b). To address these limitations, Bearden et al. (2006a) proposed a new LTO scale that

conceptualizes LTO as a two-dimensional construct, allowing it to be measured at the individual level (Hassan et al., 2011).

Hofstede et al., (2008) also researched the micro-dynamics of trust in a trade relationship, focusing on one dimension of culture only.

	Factor loading in CVS87[a]	CVS87[b]	VSM94[c]	VSM94[d]	VSM 08[e]
In your private life, how important is each of the following to you? (1. Of utmost importance [...] 5. Of very little or no importance)					
1. Persistence (perseverance)	0.76	24	11	–	(25)
2. Ordering relationships by status and observing this order	0.64	14	.	.	.
3. Thrift	0.63	23	10	10	(15)
4. Having a sense of shame	0.61	31	.	.	.
5. Personal steadiness and stability	−0.76	18	9	.	(18)
6. Protecting your "face"	−0.72	35	.	.	.
7. Respect for tradition	−0.62	39	12	12	(28)
8. Reciprocation of greetings, favours, and gifts	−0.58	8	.	.	.
(1) Persistent efforts are the surest way to results (1. Strongly agree [...] 5. Strongly disagree)	.	.	.	.	25
(3) If there is something expensive you really want to buy but you do not have enough money, what do you do? (1.Always save before buying [...] 5. Always buy now, pay off later.)	.	.	.	.	15
(5) Are you the same person at work (or at school if you are a student) and at home? (1. Quite the same [...] 5. Quite different)	.	.	.	.	18
(7) We should honour our heroes from the past (1. Strongly agree [...] 5. Strongly disagree)	.	.	.	.	28

Notes: [a]The Chinese Culture Connection (1987, p. 150); [b]The Chinese Culture Connection (1987, pp. 147-148) (nine-point scale with similar scale end points); [c]Hofstede (2001, p. 495), http://stuwww.uvt.nl/ ~ csmeets/manual.html; [d]Revised Version 1999 (Hofstede, 2001, p. 497); [e]http://stuwww.uvt.nl/ ~csmeets/ManualVSM08.doc; Hofstede uses the following formulae to compute country-level LTO scores in each survey: (a) CVS87: LTO = 50 × F + 50, where F is the factor score across the eight items in CVS87; (b) VSM94: LTO = −20m(10) + 20m(12) + 40; (old version: LTO = 45m(9) − 30m(10) − 35m(11) + 15m(12) + 67) (Hofstede, 2001, p. 497); (c) VSM08: LTO = − 40m(15) + 40m(18) − 25m(25) + 25m(28) + C(ls); where, m(x) is the country mean score for survey question (x), C(ls) is any constant that converts the LTO index score to 0 to 100 range **Sources:** Hofstede (2001, pp. 354, 370); Hofstede (2001, p. 497), http://stuwww.uvt.nl/~csmeets/manual.html, http://stuwww.uvt.nl/~csmeets/ManualVSM08.doc)

Table AI.
Hofstede survey questions for LTO

Source Venaik, Zhu and Brewer (2013)

Long-term Orientation by GLOBE

The publication of the GLOBE study has prompted renewed scholarly interest in exploring the nature of national culture dimensions, particularly those outlined by Hofstede and GLOBE (Brewer and Venaik, 2010; Maseland and Van Hoorn, 2010; Taras et al., 2010). This development provides scholars with an opportunity to compare and contrast aspects of both models to either support or challenge our understanding of national culture. Such comparisons are already appearing in the literature, including a series of papers by GLOBE and Hofstede themselves that examine their respective models (Hofstede, 2006; Javidan et al., 2006), as well as an analysis of the uncertainty avoidance dimension in both frameworks (Venaik and Brewer, 2010). Tung and Verbeke (2010) advocate for further research in this area, highlighting various important issues to enhance the quality of cross-cultural research. In their comprehensive review of cross-cultural organizational behavior research, Tsui et al. (2007, p. 462) emphasize the "critical need for a consolidation of different cultural frameworks and their measurement." They argue that "the fundamental concept of culture

has not been systematically examined, nor has there been a thorough evaluation of the many cultural frameworks with overlapping dimensions and inconsistent measurements" (Tsui et al., 2007, p. 460). There was significant confusion regarding the equivalence of the two dimensions, as reflected in the differing opinions of their respective authors. Hofstede argues that the dimensions are the same (Hofstede, 2006), while the GLOBE study maintains that they are distinct (Ashkanasy et al., 2004). Venaik, Zhu and Brewer (2013) compared the scale by Hofstede and tze GLOBE study:

	Hofstede LTO	GLOBE FO
Similarities		
1. Focus on time orientation of societies	✔	✔
2. Based on PPF rubric	✔	✔
Differences		
1. Practices/values	Values	Practices and values
2. Past-present-future dimensions	Past versus future	Present versus future
3. Item measures	Conceptually multidimensional, focus on multiple attributes such as perseverance and thrift for the future pole, and tradition and steadiness/ stability for the past pole	Conceptually one-dimensional, focus on a single planning attribute for the future pole versus the present
4. Dimension	Bipolar (LTO versus STO)	Unipolar (FO, high versus low)
5. Countries	Originally 23 (now 35)	61

Table VII.
Comparing Hofstede LTO and GLOBE FO

Source Venaik, Zhu and Brewer (2013)

Long-term orientation in dyadic relationships by Ganesan

Ganesan (1994) examined the role of LTO in dyadic relationships between buyers and sellers. A retailer's long-term orientation is the perception of interdependence of outcomes in which both a vendor's out- comes and joint outcomes are expected to benefit the retailer in the long run (Kelley and Thibaut 1978).

Marketing managers need to understand a customer's time orientation to choose and apply marketing strategies that align with the customer's time horizons. A lack of understanding in this area can lead to problems, such as using relationship marketing strategies when transactional marketing would be more suitable. Ganesan (1994) suggests that a long-term orientation in a buyer-seller relationship depends on two key factors: mutual dependence and the degree of trust between the parties (Ganesan, 1994).

Retailers with a short-term orientation are concerned only with the options and outcomes of the current period, whereas retailers with a long-term orientation focus on achieving future goals and are concerned with both current and future outcomes.

A. Retailer's long-term orientation
1. We believe that over the long run our relationship with this re- source will be profitable.
2. Maintaining a long-term relationship with this resource is im- portant to us.
3. We focus on long-term goals in this relationship.
4. We are willing to make sacrifices to help this resource from time to time.
5. We are only concerned with our outcomes in this relation- ship. (R)
6. We expect this resource to be working with us for a long time.

7. Any concessions we make
Long-term orientation by Bearden

Based on a time-focused understanding of long-term orientation (LTO), Bearden et al. (2006a, p. 457) defined LTO as "the cultural value of viewing time holistically, appreciating both the past and the future, rather than prioritizing actions solely for their immediate or short-term effects." According to this definition, a high LTO score would indicate that an individual values planning, tradition, hard work, and perseverance for future benefits (Hassan et al., 2011).

Long-term orientation (LTO) is a significant component of national cultural values, influencing consumers' decision-making processes. This article outlines the development and validation of a scale to assess LTO. The scale development process led to a two-factor, eight-item measure capturing the tradition and planning dimensions of LTO. A series of studies with over 2,000 participants from four different countries demonstrated the scale's psychometric properties, including its discriminant and convergent validity, as well as its relationship with other key theoretical concepts, such as consumer frugality, compulsive buying, and ethical values. The measures are suitable for examining individual differences in LTO both within and across different cultures (Bearden et al., 2006).

Bearden et al. (2006a) began by generating and refining items while assessing content validity. They then conducted a series of six empirical studies to evaluate the scale's dimensionality, reliability (including test-retest reliability), measurement invariance, as well as its convergent, discriminant, predictive, and nomological validity (Hassan et al., 2011).

According to Bearden et al. (2006), the measurement is:

Please describe your personal orientation

1. I consider traditions to be important
2. Respect for traditions is important
3. Family's cultural heritage is important
4. I value connections to the past
5. I work hard to obtain future success
6. I find it reasonable to give up the fun in exchange for an improved future condition
7. I think it's important to be persistent
8. I plan for a long- term future

Hassan et al. (2011) noted that while the LTO scale developed by Bearden et al. (2006a) showed consistent results across different country samples, there is still a need for an independent evaluation of the scale's psychometric properties and validity across a broader range of countries. Bearden et al. (2006a) specifically validated their scale in three non-European countries and in Austria, representing the European Union (EU).

Although Bearden et al. (2006a) included two application studies in their research, empirical studies examining the correlates of long-term orientation (LTO) remain limited (Taras et al., 2010). Previous research indicates that culture significantly affects attitudes and behaviors (e.g., Luna et al., 2002; Miller, 1984; Morris and Peng, 1994; Singh et al., 2006; Taras et al., 2010). Additionally, following

the value-attitude-behavior hierarchy proposed by Homer and Kahle (1988), there is evidence to suggest that cultural values are indeed correlated with attitudes (Hassan et al., 2011).

A multi-country Assessment of the long-term Orientation Scale by Hassan et al.

Hassan, Shiu and Walsh (2011).find the the scale by Bearden et al. 82006) is recommended for measuring LTO, though with caution. According to them, additional research is necessary to further distinguish between the two subscales: tradition and planning. Measuring and gaining a deeper understanding of cross-cultural differences in customers' LTO can help overcome challenges in effectively marketing products and services across diverse cultural settings (Hassan et al., 2011).

Item	Average factor loading[a,b]	
	Tradition	Planning
1. Respect for tradition is important to you. (Tradition)	0.78 (0.70-0.87)	0.24 (0.20-0.29)
2. You plan for the long term. (Planning)	0.20 (0.12-0.32)	0.63 (0.52-0.80)
3. Family heritage is important to you. (Tradition)	0.54 (0.17-0.70)	0.30[c] (0.21-0.54)
4. You value a strong link to your past. (Tradition)	0.67 (0.56-0.76)	0.21 (0.16-0.27)
5. You work hard for success in the future. (Planning)	0.17 (0.10-0.25)	0.69 (0.59-0.92)
6. You don't mind giving up today's fun for success in the future. (Planning)	0.38[d] (0.18-0.88)	0.53 (0.21-0.69)
7. Traditional values are important to you. (Tradition)	0.81 (0.68-0.89)	0.21 (0.14-0.28)
8. Persistence is important to you. (Planning)	0.24[e] (0.12-0.47)	0.58 (0.43-0.77)
Initial eigenvalues (62.99% variance explained)	3.76	1.29
Extracted components (51.55% variance explained)	3.31	0.81
Cronbach's alpha	0.82	0.74
Composite reliability	0.83	0.73
Average variance extracted	0.55	0.42

Notes: [a]Average factor loadings across the ten countries. The minimum and maximum values are given in parentheses; [b]to be consistent with the results reported in Bearden *et al.* (2006a), we used principal-axis factoring as the method of extraction and varimax with Kaiser normalization as the rotation method. For four of the ten countries (Belgium, France, Germany and Greece) items loaded across the two factors; [c]factor loading for Greece only = 0.54; [d]average factor loading across Belgium, Germany and Greece = 0.56; [e]factor loading for France only = 0.47. Italics are used to identify the items that loaded highest on each factor

The Relationship between long-/short-term Orientation and intuitive Decision-Making

There are numerous relationships and interactions between time and decision-making (Ariely & Zakay, 2001), making it challenging to provide a comprehensive summary of this topic. In this paper, we will explore several aspects where time and decision-making are intertwined: (a) temporal perspectives of decisions —the different time orientations decision-makers may adopt and how these perspectives influence the decision-making process and its outcomes; (b) time as a medium—the characteristics of decision processes that unfold over time; (c) time as a resource and contextual factor—the effects of limited time resources and deadlines on decision-making processes and performance; (d) time as a commodity—where time itself becomes the subject of decision-making (Ariely & Zakay, 2001),

There have been only a few studies that explore intuition from a cultural and cross-cultural perspective. Wu (2020) investigated the phenomenon of intuitive decision-making within the asset management sector by conducting in-depth semi-structured interviews and administering self-

reported cognitive tests among experienced professional fund managers from both China and Western countries (Wu, 2020).

Khan et al. (2021) examined the impact of heuristic biases, specifically availability bias and representativeness bias, on investors' decision-making in the Pakistan Stock Exchange. They also explored the moderating effect of long-term orientation on these investment decisions. They concentrated on two of the most frequently encountered heuristic-driven biases in decision-making: availability bias and representativeness bias (Tversky and Kahneman, 1973). These biases were chosen because their influence on investment decisions extends beyond just common investors; even professional and experienced investors are susceptible to these heuristic biases (Tversky and Kahneman, 1974).

- The availability heuristic is a cognitive bias where investors tend to rely on information that is most readily available to them when assessing an investment opportunity, while disregarding other potential sources of information. This inclination can lead to irrational behavior, ultimately impacting investment performance (Folkes, 1988).
- The representativeness heuristic involves the tendency of individuals to interpret a specific characteristic as representative of the entire subject, regardless of whether that characteristic is actually relevant to the subject (Khan et al., 2017). According to DeBondt and Thaler (1995), representativeness is a cognitive shortcut that reflects the extent to which an event resembles its parent population. This heuristic describes the inclination to make judgments about a social phenomenon based on stereotypes.

Pixley (2009) examined the behavior of financial firms with a focus on "temporality" and the corresponding "emotion-rules," noting that variations in these rules align with organizational definitions of uncertainty. Firms enforce specific emotion-rules based on national policies, official responsibilities, and interpretations of each type of risk. In the finance sector, the principle of *caveat emptor* (buyer or lender distrust) serves as an emotion-rule embedded in screening policies and data collection procedures to assess credit risks and potential fraud by staff, which can evoke genuine emotions. Pixley (2009) argues that three time-orientations—past, present, and long-term future—play crucial roles in shaping emotion-rules. These orientations influence how institutions construct and frame their strategies to manage uncertainty. Pixley (2009) argues that emotion-rules and time perspectives are essential in the financial sector because every task is inherently oriented toward the future. Money, as a social relation extending into the future, is rooted in the structure of debt, which introduces a higher level of uncertainty than the basic fiduciary duties of banks might imply. Money is generated through lending and can diminish sharply when bankers experience panic.

Previous research suggests that time perspective (TP)—the way individuals view the past, present, and future—is linked to decision-making style. However, no prior study has explored the relationship between time perspective and decision-making competence. To address this gap, Rönnlund et al. (2019) examined the associations between the dimensions of the Swedish Zimbardo Time Perspective Inventory (S-ZTPI) and performance on the Adult Decision-Making Competence (A-DMC) battery in a sample of older adults.

Theory Uncertainty Avoidance

Uncertainty and its influence on decision-making is a significant topic that has garnered extensive research attention within international business studies over the past five decades (Sniazhko, 2019). Uncertainty, defined as the lack of knowledge regarding the probabilities of future events (Knight, 1921), has been shown to impact various aspects of multinational corporations' operations, including their speed of international expansion, internationalization strategies, entry mode decisions, and levels of commitment (e.g., Aharoni, 1966; Aharoni, Tihanyi, & Connelly, 2011; Ahsan & Musteen, 2011; Johanson & Vahlne, 1977; Liesch, Welch, & Buckley, 2011). Because decision-makers cannot completely eliminate uncertainty, this limitation affects the effectiveness of their decisions, necessitating the use of strategies to either reduce uncertainty or manage it more effectively.

Today's managers are increasingly required to make decisions using paradigms that differ from traditional rationality and information-processing models. This is especially true in crisis situations, where there is limited time and information for evaluating choices. This could be seen as an Uncertainty. While recent management literature has provided more empirical and theoretical support for the use of intuition and tacit knowledge in decision-making, the role of emotion has not been as prominently featured (Sayegh, Anthony & Perrewé, 2004).

To encourage greater consistency in the conceptualization of uncertainty dimensions in future research, Sniazhko (2019) adopts Miller's (1992) classification of uncertainty. Miller's framework includes 13 dimensions of uncertainty, which are grouped into three categories: environmental uncertainty, industry uncertainty, and firm-specific uncertainty. This describes different kind of Uncertainties in a literature study. The following tables describe these categories as a basis for further research.

However, Ahnert & Suntrayuth (2015) had difficulties to draw the correlation uncertainity avoidance and dimension on decision-making in a study comparing Thai and German culture.

Uncertainty Avoidance and Intuition

Sayegh, Anthony & Perrewé (2004) describe management decision theory by introducing a conceptual model of managerial decision-making that highlights the significance of emotions in the intuitive decision-making process during crises (Sayegh, Anthony & Perrewé, 2004).

Ahnert and Suntrayuth (2015) compare the results of one of the most common culture models from Hofstede for the two research relevant countries, Thailand and Germany. The dimension of uncertainty avoidance reflects the extent to which members of a society feel uneasy in unstructured situations that are new, unfamiliar, surprising, or unconventional. Germans tend to show a moderate preference for uncertainty avoidance, being rule-oriented and favoring deductive thinking when presenting or planning. In line with their low power distance culture, German employees are expected to justify their decisions independently rather than relying on their superiors' broader responsibilities (Hofstede, 2001). In contrast, Thai people exhibit a higher need to avoid uncertainty compared to many other nations (Andrews & Siengthai, 2009). They seek to minimize uncertainty

by adhering to strict rules, laws, policies, and regulations. Thai society prefers maintaining control to prevent unexpected situations and is generally resistant to change and risk (Hofstede, 2001; Ahnert & Suntrayuth, 2015).

Money and Crotts (2003) examine how the cultural dimension of uncertainty (or risk) avoidance is related to information search behavior, trip planning time horizons, travel party characteristics (such as group size), and trip specifics (like length of stay). The findings reveal that consumers from cultures with higher levels of uncertainty avoidance tend to rely on information sources associated with specific channels, such as travel agents, rather than personal contacts, destination marketing materials, or mass media. These consumers are also more likely to book prepackaged tours, travel in larger groups, have shorter stays, and visit fewer destinations on average. Interestingly, contrary to what might be expected, they do not spend more time deciding to travel or booking their airline tickets (Money & Crotts, 2003).

The aim of Money and Crotts (2003) is to investigate how culture influences the process and outcomes of external information search and specific purchase decisions. The cultural dimension they focus on is Hofstede's (1980) concept of uncertainty avoidance, which measures a society's tolerance for risk. This dimension is highlighted because previous research has shown it affects information search behavior (Dawar, Parker, & Price, 1996; Money & Crotts, 2003).

Mmolotsa, G. K. (2022) describes the effect of Uncertainty Avoidance on the relationship between intuitive decision-making style and take-the-best heuristic use (intuition) in Employee Selection; a doctoral thesis from Botswana. Bate (2022) describes the nexus between Uncertainty Avoidance culture and risk-taking behaviour in entrepreneurial firms' decision-making.

Measuring Uncertainty Avoidance

According to Hofstede uncertainty avoidance can be measured as:

Please describe how you deal with uncertainty

1. It is important to have instructions spelled out in detail so that I always know what I'm expected to do.
2. It is important to closely follow instructions and procedures.
3. Rules and regulations are important because they inform me of what is expected of me.
4. Standardized work procedures are helpful.
5. Instructions for operations are important.

Measuring rational and Intuitive Decision-Making

There are different measurement instruments that describe rational and intuitive decision-making styles. The following list givesd an overview.

- CEST = Cognitive-Experiential Self-Theory (Epstein, 1994)
- REI = Rational Experiential Inventory (Pacini & Epstein, 1999);
- PMPI = Perceived Modes of Processing Inventory (Burns & D'Zurilla, 1999);
- GDMS = General Decision Making Style inventory (Scott & Bruce, 1995);
- PID = Preference for Intuition and Deliberation scale (Betsch, 2004),
- CoSI = Cognitive Style Indicator (Cools & Van den Broeck, 2007).
- TIntS = Types of Intuition Scale (Pretz et al, 2014)
- USID = Unified Scale to Assess Individual Differences in Intuition and Deliberation (Pachur and Spaar, 2015)
- BEM = Feeling the future (Bem et al., 2015)
- RHIA = Rationality Heuristic Intuition Anticipation (Launer and Svenson, 2022)
- RIDMS-E = Rational and intuitive Decision-Making Style (Launer and Cetin, 2023)

The different measurement instruments measure rational and intuitive decision-making styles in a dual process approach or three to four different dimensions. The most complete approach is described by Launer and Cetin (2023). This approach is briefly described here:

To what extend which you would agree that that statement is true for you at your current job? from 1-Definitely false to 5-Definitely true

Analytical

1.   Before I make decisions, I usually think carefully first.

2.   Instead of acting on the first idea that comes to mind, I carefully consider all my options.

3.   I make decisions in a logical and systematic way

Planning

4.   I like detailed action plans

5.   Following a clear plan in very important to me

6.   A good task is a well-planned task

Knowing

7.   I study every problem until I understand the underlying logic

8.   I enjoy solving problems that require hard thinking

9.   I prefer complex problems to simple problems

Holistic unconscious

10.   I use my general thought of whole rather the details when to decide

11.   Before I decide, I try the understand the big picture of the problem

12.   I always use big picture perspective when to decide

Spontaneous

13.   I generally make snap decisions

14.   I make quick decisions

15.   I typically figure out the way to decide swiftly

Heuristic

16.   I make decisions based on my knowledge of human nature.

17.   I make decisions based on my life experience.

18.   I've had enough experience to just know what I need to do most of the time without trying to figure it out every time

Slow unconscious

19.   When I make decisions, I always sleep over it for a night.

20.   Over time, I process many different influences on my decision.

21.   I usually set aside enough time to think things through carefully and figure out what is the be thing to do.

Emotional

22.   Feelings play a big role in my decisions.

23.   I follow my feelings when deciding.

24.   Emotions are usually more useful than thoughts for coping.

Body impulses

25.   When I make a decision, I trust my inner body feeling and somatic reactions

26.   I prefer drawing conclusions based on my feelings, my knowledge of human nature, and my experience of life

27.   I tend to use my gut feeling for my decisions

Mood

28.   When I have to take decisions, I feel afraid and/or curiosity in me

29.   When I have to make decisions, I feel anger and/or serenity inside me.

30.   When I have to decide I feel anger and/or relief in me

Anticipation (Pre-Cognition)

31.   I have a premonition of what is going to happen.

32.   I can foresee the outcome of a process.

33.   I foresee how to decide before I review all aspects

Support by others

34.   I need assistance of other people when making important decisions

35.   If I have support by others, it is easier for me to make important decisions

36.   I like to have someone to steer me in the right direction when I am faced with important decisions

Later, the authors took out the dimensions body impulses and mood from the inventory.

Conclusion

There is not much literature on intuitive decision-making and uncertainty avoidance and Long-versus Short Term orientation in the literature. More studies need to be undertaken to further explore the connection. In this study we show a brief overview of the literature and draft an inventory on how to measure uncertainty avoidance and Long- versus Short term orientatiuon in connection with rational and intuitive decision-making.

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Developing a Concept of Measuring Rational and Intuitive Decision-Making in China

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Extended Abstract

Intuition theory has been a subject of extensive research across various disciplines, including management, sociology, psychology, philosophy, neuroscience, behavioral sciences, parapsychology, medicine, health sciences, and engineering (Hodgkinson and Sadler-Smith, 2003; Sinclair & Ashkanasy, 2005; Dane & Prat, 2009; Hogarth, 2010; LeDoux, 1996; Barais et al., 2015; Craig, 2002; Damasio, 1999; Hodgkinson et al., 2008; Bem et al., 2015; Radin, 2017; Glatzer et al., 2020; Chlupsa et al., 2021; Cash & Maier, 2021; de Rooij et al., 2021). However, there is no consensus on its conceptualization and measurement due to its nonconscious nature and the intricate interactions between cognition and affect.

Intuition is a multifaceted concept that has been defined and studied differently across disciplines (Anthony, 2008). In management and psychology, it is often described as a rapid, nonconscious, and holistic decision-making process (Hodgkinson and Sadler-Smith, 2003; Dane & Prat, 2009). In philosophy, intuition refers to immediate knowledge or insight without conscious reasoning (Sinclair & Ashkanasy, 2005). In neuroscience, intuition is associated with the fast and automatic processing of information in the brain (LeDoux, 1996). Parapsychology explores intuition as extrasensory perception or psychic abilities (Bem et al., 2015; Radin, 2017). The measurement of intuition also varies across disciplines. In behavioral sciences, researchers have developed scales to assess intuitive decision-making styles (Hodgkinson et al., 2008). In medicine and health sciences, intuition is often examined through clinical judgment and diagnostic accuracy (Glatzer et al., 2020; Chlupsa et al., 2021). Engineering studies focus on intuitive problem-solving and design processes (Cash & Maier, 2021; de Rooij et al., 2021). The lack of a unified conceptualization and measurement of intuition across disciplines poses challenges for interdisciplinary research and limits the comparability of findings. It is crucial to develop a comprehensive understanding of intuition that integrates various perspectives and establishes common frameworks for its study. Such efforts would enhance collaboration and knowledge exchange among different scientific fields, leading to a more holistic understanding of intuition and its practical applications.

The purpose of this paper is to present the preliminary report on the upcoming paper: "Developing a Concept of measuring Rational and Intuitive Decision-Making in China – a Concept Study," written and conducted by the authors of this presentation. The primary aim of this presentation is to present the project, its aims and current point of progress, including intentions for conducting and analysing survey data from China.

This study is designed to introduce an integrated multidisciplinary, multidimensional framework based on existing, widely accepted studies, with the intention to comprehensively collect data which incorporates both rational and intuitive decision-making; with four additional dimensions used to assess the emotional decision-making styles. An important component of the study is to assess the influence of Chinese culture and history in the expression of these cognitive modalities. It is hoped that the findings can be used in further studies of decision-making in China.

This paper aims to develop a comprehensive measurement instrument, by combining and dividing styles from various fields and proposing new styles. The twelve styles proposed are Analytic, Planning, Knowing, Holistic Unconscious, Spontaneous, Heuristic, Slow Unconscious, Emotions, Body Impulses, Moods, Anticipation, and Support by Others. Analytic style involves logical evaluation of alternatives, Planning style is sequential and structured, Knowing style relies on factual knowledge, Holistic Unconscious style integrates diverse information in a non-analytical manner, Spontaneous style emphasizes quick decision-making, Heuristic style is experiential and automatic learning, Slow Unconscious aligns with Unconscious Thought Theory, Emotions style relies on feelings, Body Impulses style relies on gut feelings, Moods style considers the influence of positive and negative moods, Anticipation style relies on hunches, and Support by Others style involves seeking advice.

Another primary aim of the research project is to further understandings regarding whether intuitive decision making may be different in China compared to other countries and cultures. The intention is to explore cultural and historical impacts. Therefore, a preliminary component of this project is to identify the historical role of intuition in several of China's most important philosophical and spiritual traditions. The first is Daoism, including the impact of Lao Zi, Zhuang Zi and Wang Bi (Godard, 2014; Schipper, 1994). The second is Buddhism, most notably impact of the *Lankavatara Sutra* (Red Pine, 2012); Asvaghosha *(Hakeda,* 1967); and Zhiyi (1984). Finally, the influence of Confucianism on the expression of Chinese intuition is identified (Graham, 2001). The impact of such ideas and practices upon ways of knowing, embodiment shall be explored, as well as the cultivation of wise decision-making, the practice of virtue, and alignment with the *dao* (道,the way or path) and *qi* (气, vital energy). In Daoist and Confucian traditions, cultivating and refining *shen* (神, spirit, including enhanced spiritual consciousness) is essential for developing then intuitive mind. Practices which can enhance intuition include meditation, mindfulness and self-cultivation, with the aim of quieting the mind, harmonising inner energies, and connecting with the deeper wisdom of *shen.* This deep

connection is seen to enhance intuitive perception, and thus enable a higher dimension of knowledge than that which can purely be obtained via rationality.

The legacy of these historical aspects will be then traced to assess their impact on current Chinese society, potentially spanning business, economy, politics and leadership. The purpose of this conceptual study is based on the methodology of Launer and Cetin (2023), with 12 different types of decision-making styles: Analytical, Knowing, Planning, Holistic, Spontaneous, experienced-based Heuristics, Affective (feelings) like Emotions, Body Impulses, Mood as well as Anticipation, Unconscious Thinking and the Dependence on colleagues. Where necessary, the study may add additional categories for unique Chinese decision making styles. This concept combines the different approaches on intuition by CEST, GDMS, REI, PMPI, TIntS, PID, and USID. The goal is to create a multidimensional, multidisciplinary measurement instrument which fits Chinese culture. The expected outcome of this study is to establish a new basis for measuring intuition in China.

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A new Dimension on Research based on Hunches, Pre-cognition and Pre-Monition: a Scale Development Study based on Literature on Anticipation

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Abstract

The models and measurement instruments on intuition today cannot yet describe all the phenomena of intuitive decision-making behavior. In recent years, numerous new approaches have been developed, e.g. based on empathy and translational symmetry, pre-monition, paranormal belief, hunches or anticipation. Often these para-psychological approaches cannot be scientifically differentiated from coincidence. In this study, numerous studies will be summarized under the term anticipation (anticipative Intuition). Intuition based on anticipation is still in the beginning of research. In intuition measurement instrument, anticipation was included many times as one item called Hunches. However, this is not just one question but a research universe itselve.

The purpose of this theory and literature paper is to lay a theoretical foundation for intuition research based on theories about anticipation and sample inventories such as thze Anormalous Experience Inventory, the Sheep Goat Scales, Bems Feeling Future, the Paranormal and Supernatural Beliefs Scale, then study on Paranormal belief and well-being and the Survey of Scientifically Unaccepted Beliefs. The methodology is a systematic literature study and a sort of a meta analysis based on a prisma methodology. The result is a foundation for future research on intuition. In Item Selection Studies and measurement instruments, the intuitive decision-making style intuition should be always included as an own dimension.

Introduction

The models on intuition today cannot yet describe all the phenomena of intuitive decision-making behavior. In recent years, numerous new approaches have been developed, e.g. B. based on empathy and translational symmetry (Heinle, 2016).

Poli (2017) described as seeing and researching the future. Anticipation explores the question of how different kinds of systems anticipate, and examines the risks and uses of such anticipatory practices (Poli, 2017; Adams et al, 2009). Anticipation is a 'Futures Literacy' as a tool to define the understanding of anticipatory systems and processes (Miller, 2018). Anticipation is a widely studied phenomenon within a number of different disciplines, including biology and brain studies, cognitive and social sciences, engineering and artificial intelligence. There is a need for relying on at least two different levels of analysis, namely anticipation as an empirical phenomenon and the idea of an

anticipatory system or the study of the internal structure that a system should possess so that it can behave in an anticipatory fashion (Poli, 2017). It is also called Sensing the future (Blaikie & Priest, 2019; Schwarzkopf, 2014; Subbotsky, 2013). But also feeling the past (Traxler et al, 2012).

In intuition measurement instruments intuition is described in scales as an affective type of decisions based on hunches (Scott, Bruce, 1995; Pacini, Epstein, 1999; Pretz et al 2014; Pachur & Spaar, 2015). In this study we enlarge this characteristics to an own dimension called Anticipation (Launer, 2020). The received information in this regard comes from outside the body (Sinclair, 2011, 2014). Many researchers try to explain atypical or paranormal decision making (Honorton & Ferrari, 1989), anticipation of solutions, e.g. presentiments of future emotions (Radin, 2004), precognition (conscious cognitive awareness), premonitionor (affective apprehension) according to Bem et al. (2015) or anomalous cognition (Bem, 2003), extrasensory perception (ESP) by Thalbourne and Haraldsson (1980) paranormal belief and experiences (Lange, Thalbourne, 2002), or automatic evaluation (Ferguson, Zayas, 2009).

Paranormal Beliefs

Studies have reported positive correlations between belief in the paranormal and psychopathological outcomes (Thalbourne and Storm, 2019; Liu et al., 2021). These include, but are not restricted to, greater incidence of psychiatric (Dag, 1999; Peltzer, 2002), depressive (Thalbourne and French, 1995), and manic (Thalbourne and French, 1995) symptoms. A commonly cited explanation for these associations is the psychodynamic functions hypothesis (Irwin, 2009). This proposes that paranormal belief arises from personal attempts to impose order on the world. Belief in this context resolves uncertainty by providing meaning and/or the illusion of control (Irwin, 1993, 2003, 2009). Central to this process is magical ideation, which denotes "belief in forms of causation that by conventional standards are invalid" (Eckblad and Chapman, 1983, p. 215). Magical ideation often functions as a coping strategy when individuals believe they lack power (Ofori et al., 2017; Drinkwater et al., 2019). Consistent with this supposition, McGarry and Newberry (1981) reported that paranormal believers have a generalised tendency to view the world as unjust, problematic, and unpredictable (Roe and Bell, 2016; Stone, 2016).

The notion that paranormal belief can in some circumstances provide a sense of control implies that credence performs an adaptive function (Schumaker, 1987; Dean et al., 2021; Parra and Giudici, 2022). This, however, this is not necessarily the case since psychological benefits are typically restricted to specific situations (Roe and Bell, 2016). Thus, paranormal belief generally signifies poorer psychological functioning and is indicative of heightened distress. Though there is scholarly evidence to support this proposition, it is inconsistent with the high levels of paranormal endorsement (credence, experience, and ability) observed in non-clinical populations (see Dagnall et al., 2016c; Williams et al., 2021). This is evidenced by surveys, which report that paranormal belief is common within contemporary Western societies. For instance, a 2005 Gallup poll (Moore, 2005) found that three in four Americans acknowledged at least one paranormal belief (Irwin et al., 2012a).

Recognising the prevalence of paranormal beliefs, it is reasonable to conclude that within general samples supernatural credence, in the absence of concomitant cognitive-perceptual characteristics, has a benign (non-threatening) effect on well-being. Thus, paranormal belief is only problematic when it interacts with psychological factors, which distort perception and mentation (Irwin et al., 2012a,b). In such instances, paranormal belief may serve as an interpretative lens that structures cognitions (Drinkwater et al., 2021). This supposition suggests that supernatural credence is indicative, not determinative of mental state. From this perspective, paranormal belief has only an indirect effect on well-being via its associations with cognitive-perceptual factors (Irwin, Dagnall & Drinkwater, 2013).

Radin follows a scientifically well-based explanatory model. He who works as a senior scientist at the Institute of Noetic Sciences (Radin, 2004a; Radin & Borges, 2009). In various experiments he was able to prove that people can anticipate the future by measuring skin resistance (lie detector principle) (Radin, 2004a) and the dilation of pupils (Radin & Borges, 2009).

Recent meta-studies that examined a total of up to 90 experiments and studies with anticipation (Bem et al., 2015) confirm the effects measured by Radin (Mossbridge et al., 2014; Mossbridge et al., 2014 and 2015). An individual's cognitive and affective responses can be influenced by randomly selected stimulus events that do not occur until after his or her responses have already been made and recorded, a generalized variant of the phenomenon traditionally denoted by the term precognition (Bem, 2011; Bem et al, 2015).

Humans continuously evaluate aspects of their environment (people, objects, places) in an automatic fashion (i.e., unintentionally, rapidly). Such evaluations can be highly adaptive, triggering behavioral responses away from threats and toward rewards in the environment. Even in the absence of immediate threats and fleeting rewards, the ability to automatically evaluate aspects of the environment enables individuals to effortlessly make sense of their world without depleting limited and valuable cognitive resources (Ferguson & Zayas, 2009).

Psi generally falls into two categories: gathering information from the environment and interaction with the environment. The former is usually described as ESP, remote viewing, telepathy, clairvoyance and precognition (May & Marwaha, 2015). The proposition that psi is operative not as an anomaly but as a normative component of information processing was investigated, focusing on the normative operation of precognition - called automatic evaluation (Ferguson & Zayas, 2009). the notion that psi may be able to function without conscious intent and mediate adaptive consequences is a feature of several theories of psi. In particular, stanford's "Psi-mediated Instrumental response" (PMIr) model predicts that psi can operate without conscious awareness, facilitating advantageous outcomes by triggering preexisting behaviours in response to opportunities or threats in the environment (Hitchman, 2012; Hitchman, Roe, Sherwood, 2012a and 2012b).

Latest research suggests that belief in the paranormal serves as a mechanism for coping with stress (Irwin, 1992) and that it is positively associated with high emotional intelligence or EI (Dudley, 2002).

Therefore, Rogers et al (2006) examinied the extent to which coping strategy predicts, and EI moderates, belief in the paranormal.

Do individuals who endorse paranormal beliefs differ from those reporting actual precognitive experiences? A study showed that Extraversion and intuition were associated with precognitive experience, but not with paranormal belief; dissociative tendencies were related to paranormal belief, but not precognitive experience (Rattet & Bursik, 2001).

Anticipation has not yet been extensively treated in business administration, psychology and other sciences. The term comes more from sports psychology. V. m. anticipating moves. The latest work on this is about the anticipation of soccer goalkeepers by Florian Schulz from the University of Tübingen (2013). In their meta-analysis "Feeling the future: A meta-analysis of 90 experiments on the anomalous anticipation of random future events (National Institutes of Health" (2016), Bem, Tressoldi, Rabeyron and Duggan describe that anticipation is fundamentally possible. Roe, Grierson,and Lomas (2012) showed two independent replication attempts as well. Maier et al (2014) showed retroactive avoidance of negative stimuli.

Poli (2017) described as seeing and researching the future. He establishes anticipation of the future as a legitimate topic of research. It examines anticipatory behavior, id est a behavior that 'uses' the future in its actual decisional process. Anticipation violates neither the ontological order of time nor causation. Anticipation explores the question of how different kinds of systems anticipate, and examines the risks and uses of such anticipatory practices (Poli, 2017; Adams et al, 2009). Anticipation is a 'Futures Literacy' as a tool to define the understanding of anticipatory systems and processes (Miller, 2018).

Anticipation comes in many different guises. The simplest distinction is between explicit and implicit anticipation. Explicit anticipations are those of which the system is aware. Implicit anticipations, by contrast, work below the threshold of awareness. Anticipatory systems show forms of impredicativity, that is the presence of self-referential cycles in their constitution. The main distinction within self-referential systems is between incomplete and complete forms of self-reference. Logical forms of self-reference are typically incomplete because they need an external interpreter (Poli, 2018).

Anticipation in Sports

Anticipation has become an increasingly important research area within sport psychology since its infancy in the late 1970s. Early work has increased our fundamental understanding of skilled anticipation in sports and how this skill is developed. With increasing theoretical and practical insights and concurrent technological advancements, researchers are now able to tackle more detailed questions with sophisticated methods. Despite this welcomed progress, some fundamental questions and challenges remain to be addressed, including the (relative) contributions of visual and motor experience to anticipation, intraindividual and interindividual variation in gaze behaviour, and the impact of non-kinematic (contextual or situational) information on performance and its interaction

with advanced kinematic cues during the planning and execution of (re)actions in sport (Loffing & Cañal-Bruland, 2017).

In sports, the concept of anticipating future moves by people is also called heuristics (Grush, 2004; Williams, Ward, 2007; Schultz, 2013), however it rather belongs to the heuristic theory (Launer, 2020). However, sports will not be investigated. It can be believed, that anticipation in sports is mainly based on experience-based and trained heuristics.

Results

Meta Analysis

There are meta level analysis on all king of research regarding anticipation (Nadin, 2010).

A meta-analysis of all forced-choice precognition experiments appearing in English language journals between 1935 and 1977 was published by Honorton & Ferrari (1989). Their analysis included 309 experiments conducted by 62 different investigators involving more than 50,000 participants. Honorton and Ferrari reported a small but significant hit rate, Rosenthal effect size $z/\sqrt{n}$ = .02, Stouffer Z = 6.02, p = 1.1 × 10-9. They concluded that this overall result was unlikely to be artifactually inflated by the selective reporting of positive results (the so-called file-drawer effect), calculating that there would have to be 46 unreported studies averaging null results for every reported study in the meta-analysis to reduce the overall significance of the database to chance (Honorton & Ferrari, 1989).

A review and meta-analysis of methodological and subject variables influencing the exposure–affect relationship was performed by Bornstein (1989). It was on studies of the mere exposure effect published in the 20 years following R. B. Zajonc's (see record 1968-12019-001) seminal monograph. Stimulus type, stimulus complexity, presentation sequence, exposure duration, stimulus recognition, age of subject, delay between exposure and ratings, and maximum number of stimulus presentations all influence the magnitude of the exposure effect. Implications of these findings are discussed in the context of previous reviews of the literature on exposure effects and with respect to prevailing theoretical models of the exposure–affect relationship (Bornstein, 1989).

Across 7 experiments (N = 3,289), Galak et al (2012; Galak & Meyvis, 2011) replicate the procedure of Experiments 8 and 9 from Bem (2011), which had originally demonstrated retroactive facilitation of recall. We failed to replicate that finding. We further conduct a meta-analysis of all replication attempts of these experiments and find that the average effect size (d = 0.04) is no different from 0. We discuss some reasons for differences between the results in this article and those presented in Bem (2011)

The presentiment effect has now been demonstrated using a variety of physiological indices, including electrodermal activity, heart rate, blood volume, pupil dilation, electroence philographic activity, and fMRI measures of brain activity. A meta-analysis of 26 reports of presentiment experiments published between 1978 and 2010 yielded an average effect size of 0.21, 95% CI = [0.13, 0.29], combined z = 5.30, p = 5.7 × 10-8. The number of unretrieved experiments averaging

a null effect that would be required to reduce the effect size to a trivial level was conservatively calculated to be 87 (Mossbridge et al., 2012; see also, Mossbridge et al., 2014). A critique of this meta-analysis has been published by Schwarzkopf (2014) and the authors have responded to that critique (Mossbridge et al., 2015).

The meta analysis by Bem et al (2015) report a meta-analysis of 90 experiments from 33 laboratories in 14 countries which yielded an overall effect greater than 6 sigma, $z = 6.40$, $p = 1.2 \times 10$ with an effect size (Hedges' g) of 0.09. A Bayesian analysis yielded a Bayes Factor of 5.1×10, greatly exceeding the criterion value of 100 for "decisive evidence" in support of the experimental hypothesis. When DJB's original experiments are excluded, the combined effect size for replications by independent investigators is 0.06, $z = 4.16$, $p = 1.1 \times 10$, and the BF value is 3,853, again exceeding the criterion for "decisive evidence." The number of potentially unretrieved experiments required to reduce the overall effect size of the complete database to a trivial value of 0.01 is 544, and seven of eight additional statistical tests support the conclusion that the database is not significantly compromised by either selection bias or by intense "p -hacking"—the selective suppression of findings or analyses that failed to yield statistical significance. P-curve analysis, a recently introduced statistical technique, estimates the true effect size of the experiments to be 0.20 for the complete database and 0.24 for the independent replications, virtually identical to the effect size of DJB's original experiments (0.22) and the closely related "presentiment" experiments (0.21). We discuss the controversial status of precognition and other anomalous effects collectively known as psi (Bem, 2011; Bem et al, 2015).

Experiments

Bem et al, 2015) give an overcview of typical experimenmts done to research anticipation.:

- Retroactive and pre-cognitive priming (Klauer & Musch, 2003; Rabeyron, 2014; Vernon, 2013)
- Time reversed affective processing (Batthyany, 2009; Batthyany & Spajic, 2008; Bierman, 2010; Popa & Batthyany, 2012))
- Retroactive habituation (Bornstein, 1989; Zajonc, 1968; Dijksterhuis & Smith, 2002; Hadlaczky & Westerlund, 2005; Morris, 2012; Savitsky, 2003; Savva et al, 2004 and 2005; Starkie, 2009)
- Retroactive facilitation of recall (Bem et al, 2015; Tressoldi & Zanette. 2012; Tressoldi, Masserdotti, Marana, 2012 and 2013)

In 2011, Bem published a report of nine experiments in the Journal of Personality and Social Psychology purporting to demonstrate that an individual's cognitive and affective responses can be influenced by randomly selected stimulus events that do not occur until after his or her responses have already been made and recorded, a generalized variant of the phenomenon traditionally denoted by the term precognition (Bem, 2011, Tressoldi, 2015)

Two experiments tested time-reversed versions of one of psychology's oldest and best known phenomena, the Law of Effect Amendments from Version 1 Updated the P-Curve analysis and its discussion using the fourth version of the P-Curve algorithm, and updated Figure 2 to reflect this. We have also added the results of the BF robustness analysis related to the independent replications, and corrected a typo in the abstract related to the value of the overall BF (Thorndike, 1898). An organism is more likely to repeat responses that have been positively reinforced in the past than responses that have not been reinforced.

Standardized Emotion Elicitation Databases (SEEDs) allow studying emotions in laboratory settings by replicating real-life emotions in a controlled environment (Branco et al,2023). In 1993, the International Affective Picture System (IAPS; Lang, Bradley & Cuthbert, 1997 and 2005; Lang & Greenwald, 1993) produced a set of more than 1100 digitized photographs that have been rated for valence and arousal. This is for studying emotions in laboratory settings by replicating real-life emotions in a controlled environment. Branco et al (2023) show 69 studies done based on IAPS.

Priming experiments have become a staple of cognitive social psychology (Klauer & Musch, 2003). In a typical affective priming experiment, participants are asked to judge as quickly as they can whether a photograph is pleasant or unpleasant and their response time is measured. Just before the picture appears, a positive or negative word (e.g., beautiful, ugly) is flashed briefly on the screen; this word is called the prime. Individuals typically respond more quickly when the valences of the prime and the photograph are congruent (both are positive or both are negative) than when they are incongruent (Klauer & Musch, 2003).

"Presentiment" experiments were pioneered by Radin (1997) and Bierman (Bierman & Radin, 1997) in which physiological indices of participants' emotional arousal are continuously monitored as they view a series of pictures on a computer screen. Dean Radin follows a scientifically well-based explanatory model. Dean Radin, who works as a senior scientist at the Institute of Noetic Sciences (Radin, 2004a; Radin & Borges, 2009) researched XXXX. In various experiments he was able to prove that people can anticipate the future by measuring skin resistance (lie detector principle) (Radin, 2004a) and the dilation of pupils (Radin & Borges, 2009).

Using a non-intentional precognition test paradigm luck beliefs were explored as predictors of psi in a series of three experiments (Luke, Delanoy & Sherwood, 2008; Luke, Roe & Davison, 2008). In addition, the experiments were designed to explore aspects of Stanford's (e.g., 1990) 'psi-mediated instrumental response' (PMIR) model, within which the notion fits quite neatly that luckiness may ordinarily be used euphemistically to account for everyday unconscious psi. The current study describes a basic replication of the non-intentional precognition effect and compares it to intentional precognition (Luke & Morin, 2009; Luke & Roe, 2008a and 2008b)

Two of Bem's time-reversed experiments tested whether rehearsing a set of words makes them easier to recall even if the rehearsal takes place after the recall test is administered (Retroactive facilitation of recall; Bem et al, 2015). Bem published more experiments in the Parapsychological

Association (Bem, 2003; Bem, 2005; Bem, 2008). As a result, replications of the experiments began to appear as early as 2001 (as reported in Moulton & Kosslyn, 2011).

Critique on Anticipation

Bem's experiments have been extensively debated and critiqued. The first published critique appeared in the same issue of the journal as Bem's original article (Wagenmakers et al., 2011). These authors argued that a Bayesian analysis of Bem's results did not support his psi-positive conclusions and recommended that all research psychologists abandon frequentist analyses in favor of Bayesian ones. Bem et al. (2011) replied to Wagenmakers et al., criticizing the particular Bayesian analysis they had used and demonstrating that a more reasonable Bayesian analysis yields the same conclusions as Bem's original frequentist analysis. In a similar critique, Rouder & Morey (2011) also advocated a Bayesian approach, criticizing the analyses of both Bem and Wagenmakers et al. (Bem et al, 2015). Platzer (2011) showed the failure to replicate Bem (2011) Experiment 9 (Milyavsky, 2010). Ritchie, Wiseman, and French (2012) showed in failing the future three unsuccessful attempts to replicate Bem's 'retroactive facilitation of recall' effect as well as Robinson (2011) with a failed replication of Retroactive Facilitation of Memory Recall.

Developing an Inventory

The Anomalous Experiences Inventory (AEI; Gallagher, Kumar, & Pekala, 1994) narrows the scope of the Mental Experience Inventory (MEI; Kumar & Pekala, 1992) by excluding items that do not directly pertain to anomalous and paranormal beliefs and experiences (e.g., introspection, daydreaming, fantasizing); and it also expands the scope of the measure by including a broader range of items concerning anomalous and paranormal beliefs and experiences. Items to assess past and present experiences and beliefs about one's own paranormal abilities (e.g., I am able to move or influence objects with the force of my mind alone") were added. Five subscales were confirmed: anomalous experiences, beliefs, powers of the mind, fear, and drug use. The measure consists of 98, 70, 57, or 30 items for which participants indicate whether the item is true or false. The AEI's five subscales fared well with respect to both reliability and validity. The KR-20 values ranged between .64 and .85 for the five scales. The AEI's experiences, beliefs, and abilities subscales were significantly correlated with the global paranormal measures of Richards, Tobacyk, and Davis et al. Considered together they were significantly correlated with four of Tobacyk's paranormal belief subscales. The AEI's fear and drug use subscales correlated less well with other anomalous/ paranormal measures. The AEI subscales showed some convergent validity when correlated with selected personality measures. The AEI's experiences, beliefs, and abilities subscale, as expected, correlated significantly with traits that are related to experience seeking and fantasy proneness. The drug use scale also showed evidence of convergent validity when correlated with sensation-seeking measures (Gallagher, Kumar & Pekala, 1994)

Paranormal Belief

1. I have extrasensory perception and have mastered psychokinesis

2. I often have so-called déja vu experiences

3. My conscious feelings expand beyond my body

4. I often have psychological borderline experiences

5. I dream some professional decisions in advance

6. I receive messages from outside that help me with professional decisions

7. I have had near-death experiences that affect me professionally

Abnormal abilities?

8. I have extra-physical experiences and experiences

9. I have mystical experiences that support me professionally

10. I have out-of-body experiences

11. I have past life memories

12. I can communicate with deceased people and ask them for advice

13. I have apparitions that guide me

14. Forces from outside influence me

15. For professional decisions I usually use the cards

16. For professional decisions I use astrology and my horoscope.

17. My horoscope describes my professional decisions

18. For professional decisions I read / classify from the palm of my hand

19. I have abnormal abilities

20. I can influence professional decisions by focusing on them

21. I can influence my state of consciousness

22. I have supernatural abilities

23. I can see professional decisions in the distance

24. I can recognise people's auras

25. I am a medium and let it guide my decisions

26. I can leave my body and look at decisions from the outside

27. I can influence other people's decisions if I concentrate on them

28. I can explore my decisions under hypnosis

AEI Item correlations with Paranormal Scales

| | Paranormal Scales | | |
Scale/Items	Richards's Experience	Davis's Belief	Tobayck's Belief
Anomalous/Paranormal Experience			
14. At times, my consciousness feels expanded beyond my body	.36	.29	.30
16. I often have déjà vu experiences	.20	.14	.10
22. I often seem to become aware of events before they happen	.35	.22	.18
26. I often have psychic experiences	.45	.24	.23
29. There have been events that I dreamed about before the event occurred	.34	.28	.24
31. I have attended seances	.22	.14	.22
33. I have had a near death experience	.17	.05	.11
39. I often know what others are feeling or thinking without them telling me	.27	.15	.16
41. I have experienced other planes of existence beyond the physical	.24	.13	.17

Scale/Items	Paranormal Scales		
	Richards's Experience	Davis's Belief	Tobayck's Belief
45. I have experienced my physical body or objects floating in the air (levitation)	.23	.06	.11
46. I have had a psychic experience	.47	.26	.26
49. I use a ouija board on a regular basis	.17	.11	.17
57. I have experienced objects appearing or disappearing around me (materialization or dematerialization)	.24	.15	.17
59. I have had a mystical experience	.42	.27	.29
61. I have had an out-of-body experience	.24	.16	.18
69. I have had memories of a past life	.17	.12	.11
72. I have communicated with the dead	.30	.26	.28
73. I have seen a ghost or apparition	.38	.33	.37
74. I have had the experience of time standing still	.34	.14	.18
75. At times, I have felt possessed by an outside force	.28	.18	.25
78. I have experienced or met an extraterrestrial	.05	–.00	.03
84. I visit fortune tellers, palm readers, tarot card readers, or astrologers	.20	.27	.31
90. My bizarre predictions have often come true	.42	.29	.27
92. My horoscope is fairly accurate	.27	.30	.31
93. I have had waking visions of an event which subsequently occurred	.41	.28	.30
94. I have had a psychic or mystical experience which scared me to death	.33	.17	.21
95. I have seen elves, fairies, and other types of little people	.07	–.03	.00
97. I have seen a UFO	.08	.16	.16
98. I have experimented with witchcraft or sorcery	.25	.29	.32

Anomalous/Paranormal Belief

5. I believe that mind can control matter	.19	.24	.25
19. I believe in life after death	.11	.21	.27
21. I believe I have great power and energy within me waiting to be awakened	.21	.28	.24
23. I want to understand the further reaches of my mind	.11	.25	.19
35. I believe that many paranormal occurrences are real	.26	.45	.45
37. I feel my mind can expand beyond its usual boundaries	.21	.34	.33
38. I believe in the unconscious	.20	.36	.35
42. I believe in reincarnation	.11	.35	.38

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| | Paranormal Scales | | |
Scale/Items	Richards's Experience	Davis's Belief	Tobayck's Belief
48. I have lived before	.23	.19	.24
51. I believe there is intelligent life on other planets	.15	.35	.36
64. I believe that people have energy (an aura) surrounding their bodies	.28	.41	.46
86. I practice witchcraft or sorcery	.06	.06	.06

Anomalous/Paranormal Ability

3. I can influence or change an event by concentrating on that event	.18	.12	.11
12. I am able to move or influence objects with the force of my mind alone	.16	.09	.14
15. I can alter my state of consciousness at will	.24	.09	.06
32. I am able to communicate with supernatural forces	.11	.04	.14
36. I have spoken in tongues	.10	−.03	.03
44. I have become aware of events that took place far away (clairvoyance)	.32	.10	.14
56. I can heal a sick or injured person with healing energy from my mind and body	.18	.02	.07
60. I am able to see auras surrounding peoples' bodies	.20	.08	.13
63. I have tried channeling or have been a medium	.21	.11	.10
70. I can use dowsing to find underground water, minerals, or other objects	.09	−.00	.02
76. I can leave my body and return to it at will	.24	.04	.08
77. I can experience others' feelings as they experience them	.34	.14	.17
82. I am able to communicate with the dead	.22	.19	.20
83. I can control my own dreams	.28	.11	.13
88. I am psychic	.28	.22	.16
96. I have hurt someone by wishing them ill will or by thinking evil thoughts about them	.23	.13	.12

Fear of the Anomalous/Paranormal

11. Hearing about the paranormal or psychic experiences is scary	−.01	−.10	−.05
25. I am afraid of being hypnotized	−.06	−.11	−.08
43. Using a ouija board frightens me	−.02	.01	.01
52. I am afraid to visit a psychic or fortune teller	−.02	−.04	−.01
55. I'm afraid of having an altered-state experience	−.04	−.03	−.04

| | Paranormal Scales | | |
Scale/Items	Richards's Experience	Davis's Belief	Tobayck's Belief
89. I'm afraid of having a psychic experience	−.06	−.03	.07

Use of Drugs and Alcohol

10. I have tried mind-altering substances	.03	.12	.15
27. I have smoked marijuana	.00	.07	.08
50. I have taken LSD	.03	.07	.11
58. I drink alcohol	−.02	.01	−.01
71. I have used cocaine	−.02	−.01	.06
85. I have had a psychic experience under the influence of alcohol	.05	.06	.12
91. I have used heroin	−.05	−.09	−.12

Note: Correlations of 0.17 or higher are significant at $p < .001$ level.

The Revised Paranormal Belief Scale (RPBS, Tobacyk, 2004) is a widely used measure of paranormal belief. The instrument comprises 26 statements (e.g., "The number 13 is unlucky"). Participants respond using a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). Consistent with Rasch, scaling scores were converted to 0–6 (see Irwin, 2009). Higher scores in dicate greater belief in the paranormal. The RPBS has established psychometric properties (i.e., validity and reliability) (Drinkwater et al., 2017). In this study, the RPBS demonstrated excellent omega (ω = 0.96) and alpha (α = 0.95) reliability.

Bem Feeling the Future Inventory

AN01_01   Bei beruflichen Entscheidungen spüre ich in meinem Körper Informationen, die lokal nicht vorhanden sind

AN01_02   Ich spüre Informationen, die nicht physiologisch oder biologisch erklärbar sind

AN01_03   Ich habe telepathische Fähigkeiten

AN01_04   Ich kann die Gedanken anderer Menschen spüren

AN01_05   Ich kann Informationen aus meinem Umfeld wahrnehmen

AN01_06   Ich kann Informationen aus dem Universum wahrnehmen

AN01_07   Ich kann Informationen wahrnehmen ausserhlab der typischen menschlichen Sinne

AN01_08   Ich kann präkognitiv Reize erkennen

AN01_09   Ich kann präkognitive negative Reize vermeiden

AN01_10   Göttliche Eingebungen helfen mir bei beruflichen Entscheidungen

AN01_11   Ich erhalte Stimmulierungen von außen, die mir bei beruflichen Entscheidungen helfen

The phrase 'the Australian Sheep-Goat Scale', or ASGS for short, refers to a item inventory (or family of measures) of belief in various aspects of the paranormal, such as the extrasensory perception (ESP), life after death (LAD), and psychokinesis (PK). The term 'sheep' is used for 'believer' in some aspect of psychic phenomena, while 'goat' is used for 'disbeliever'. Paranormal phenomena have in common the fact that they contradict C. D. Broad's (1978) Basic Limiting Principles about the existence and operation of mind in the mathematico-physical world, and are therefore in some sense anti-scientific. This paper describes the evolution of the ASGS from a 10-item instrument to an 18-item measure. Since the beginnings of the ASGS in 1976, versions of the scale have been administered frequently, and a summary is here provided of relevant empirical findings, both parapsychological and psychological. Finally, a new and improved 26-item version of the scale is offered, based upon, and named for, attitude towards the Basic Limiting Principles (Thalbourne, 2010).

(1) I believe in the existence of ESP.
(2) I believe I have had personal experience of ESP.
(3) I believe 1 am psychic.
(4) I have had at least one hunch that turned out to be correct and which (I believe) was not just a coincidence.
(5) I have had at least one premonition about the future that came true and which (I believe) was not just a coincidence
(6) I have dreamt at least one dream that came true and which (I believe) was not just a coincidence.
(7) I have had at least one vision that was not an hallucination and from which I received information that I could not have otherwise gained at that time and place.
(8) I believe in life after death.
(9) I believe that some people can contact spirits of the dead.
(10) I believe I have had at least one experience of telepathy between myself and another person.

Table 3. The three items comprising E.H.'s Sheep-Goat Scale, translated from the Icelandic

(1) Do you read books or articles on psychic phenomena?
  1. Never
  2. Seldom
  3. Now and then
  4. Often

(2) Do you believe in the existence of thought-transference, telepathy or clairvoyance?
  1. Unthinkable
  2. Unlikely
  3. Likely
  4. Certain

(3) Do you believe in the ability to know the future or have dreams of it?
  1. Unthinkable
  2. Unlikely
  3. Likely
  4. Certain

The Sheep-Goat Scale score is obtained by summing the point-scores opposite each individual response.

Survey of Scientifically Unaccepted Beliefs

Irwin and Marks (2013) reported the psychometric development of new measure of paranormal and related beliefs. Based on a constructive review of the limitations of current self-report questionnaires several criteria were formulated for development of the new measure. One of the key criteria was that items had to meet an explicit definition of scientifically unaccepted beliefs, thereby allowing inclusion in the new measure of a broad range of paranormal beliefs, traditional religious beliefs, urban myths, and similar beliefs currently not accepted by the scientific mainstream. The new Survey of Scientifically Unaccepted Beliefs is commended to researchers for its distinctive conceptual perspective, its elegant psychometric structure, and its sophisticated psychometric properties.

SSUB showing Principal Component Loadings on each Subscale

Item #	Item	Subscales	
		1	2
53	Haunted houses are a figment of the imagination. (-)	.75	
21	The idea of predicting a person's future from lines on the palm of their hand is foolish. (-)	.73	
5	Some psychics have solved baffling murder cases by paranormal means.	.73	
31	Fortune tellers can accurately sense the future using a crystal ball.	.71	
35	Sometimes one's spirit can briefly move outside the body (astral projection).	.71	
20	The positions of the planets at a person's birth can affect how their personality will develop.	.70	
12	Professionally constructed horoscopes for individual people can accurately predict the future.	.69	
47	If a picture falls off the wall at the moment of a loved one's death it is mere coincidence. (-)	.67	
81	Telepathy (communication directly from mind to mind) is simply impossible. (-)	.66	
44	Fairies, pixies and similar beings are real.	.66	
11	Fortune tellers' predictions typically are based on judicious guesswork. (-)	.65	
32	Reports of apparent ESP (extrasensory perception) are generally just naïve fantasies. (-)	.65	
66	With regard to one's health, it is always best to rely on a trained physician rather than to dabble. (-)	.63	
89	In many primitive tribes the shaman or "witch doctor" exercises powers we can't explain.	.60	
24	Crop circles, or large patterns of flattened crops such as wheat, are made by people, not extraterrestrial aliens. (-)	.60	
83	The universe and all life was created by a supernatural being (God).		.85
52	God does not really exist. (-)		.83
4	The Devil (Satan) is a real entity.		.79
48	There is a Hell, where unbelievers or sinners are punished.		.76
16	Prayers will not achieve any more than you could achieve by your own efforts. (-)		.74
Cronbach's alpha		.93	.90
Variance explained		37.4%	16.0%

Dean, Akhtar, Gale, Irvine, Wiseman, and Laws (2021) developed a Paranormal and Supernatural Beliefs Scale using classical and modern test theory. Classical test theory methods (including exploratory factor analysis and principal components analysis) reduced the scale to 14 items and one overarching factor: Supernatural Beliefs. The factor demonstrated high internal reliability, with an excellent test–retest reliability for the total scale. Modern test theory methods (Rasch analysis using a rating scale model) reduced the scale to 13 items with a four-point response format. The Rasch scale was found to be most effective at differentiating between individuals with moderate-high levels of paranormal beliefs, and differential item functioning analysis indicated that the Rasch scale represents a valid measure of belief in paranormal phenomena (Dean et al, 2021). This goes along with the objective measurement of paranormal belief by Lange, Irwin & Houran (2001).

The following questions concern your beliefs about paranormal phenomena. There are no right or wrong answers. This is a sample of your own beliefs and attitudes. Please be honest in your responses. Thank you.

0 = Strongly Disagree   1 = Disagree   2 = Agree   3 = Strongly Agree

1. Your mind or soul can leave your body.
2. If you break a mirror, you will have bad luck.
3. It is possible to be reincarnated.
4. Mind reading is possible.
5. A person's star sign can have a direct influence on their personality.
6. Fairies and similar beings are real.
7*. Fortune tellers' predictions are typically based on guesswork.
8*. Reports of an apparent sixth sense are generally based on fantasies.
9. Some health conditions can be treated with psychic healing.
10. In some cultures, shamans or "witch doctors" exercise powers we cannot explain.
11. Having a dream that comes true is not just a coincidence.
12*. Communicating with spirits or other supernatural entities through a Ouija board is not possible.
13. It is possible to become possessed by an evil supernatural entity.

Note. Items 7, 8, and 12 are reverse scored.

The study on Paranormal belief and well-being

The study of Dagnall, Denovan & Drinkwater (2022) and Irwin, Dagnall & Drinkwater, 2013) examined variations in well-being as a function of the interaction between paranormal belief and psychopathology-related constructs. A United Kingdom-based, general sample of 4,402 respondents completed self-report measures assessing paranormal belief, psychopathology (schizotypy, depression, manic experience, and depressive experience), and well-being (perceived stress, somatic complaints, and life satisfaction).

Q1. I have had a dream about something of which I was previously unaware, and subsequently the dream turned out to be accurate.

    Yes, and it must have been an instance of telepathy or esp

    Yes, but it was probably just a coincidence or unwitting insight

    No

Q2. I have stared at the back of someone's head and eventually they turned around and looked at me.

    Yes, and it must have been an instance of telepathy or esp

    Yes, but it was probably just a coincidence or something else I did

    No

Q3. Sometimes I've been thinking of a person I haven't heard from in ages, and later in the day I received a phone call, email or letter from that very person.

    Yes, and it must have been an instance of telepathy or esp

    Yes, but it was probably just a coincidence or rational expectation

    No

Q4. With someone I know intimately I sometimes know what they are about to say before they say it.

Yes, and it must have been an instance of telepathy or esp

Yes, but it was probably just a lucky guess based on my familiarity with them

No

Q5. On at least one occasion I've had the impression of a figure nearby, yet nobody could possibly have been there.

Yes, and it must have been an experience of an apparition or ghost

Yes, but it was probably just an illusion or misperception

No

Q6. I have become aware of a scent in a room, yet there was nothing there that could have that smell.

Yes, and it must have been an instance of an apparition or esp

Yes, but it was probably just an illusion or physiological anomaly

No

Q7. I have had an impression that a specific event was occurring at some distant location and subsequently the impression turned out to have been accurate.

Yes, and it must have been an instance of clairvoyance or esp

Yes, but it was probably just a coincidence or rational expectation

No

Q8. I have seen an envelope of light around a person, and the color of the light depended on that person's mood or wellbeing.

Yes, and it must have been an instance paranormal aura perception

Yes, but it was probably just an illusion or physiological anomaly in me

No

Q9. I have accurately foretold a future event when I could not possibly have known it would occur.

Yes, and it must have been a case of a premonition or esp

Yes, but it was probably just good judgment or a coincidence

No

Q10. I have seen a pet become excited shortly before its owner arrived back home.

Yes, and it must have been an instance of telepathy or esp

Yes, but it was probably just the pet having learned when its owner would return or using its acute hearing to detect the owner's approach

No

Q11. On at least one occasion I have had the impression that I, my perceiving self, was outside my physical body and seeing the vicinity from an external vantage point.

Yes, and it must have been a paranormal separation of mind from body

Yes, but it was probably just an illusion or misperception

No

Q12. On at least one occasion I have had the impression I was in direct contact with the spirit of a deceased person.

Yes, and it must have been an instance of channeling or paranormal communication with a discarnate being

Yes, but it was probably just an illusion or wishful fantasy

No

Q13. I have had the experience of being healed by another person using only the power of their mind.

Yes, and it must have been a case of psychic healing

Yes, but it was probably just an effect of suggestibility

No

Q14. On at least one occasion an object near me unaccountably moved or fell at the very time a loved one was undergoing a trauma at a distant location.

Yes, and it must have been an example of paranormal action or psychokinesis

Yes, but it was probably just a coincidence or a minor earth tremor

No

Q15. I have seen (in person or on television) a psychic levitate an object.

Yes, and it must have been an instance of paranormal action or psychokinesis

Yes, but it was probably just a conjurer's trick

No

Q16. In a life-threatening situation I have had the impression that my disembodied "self" was moving along a tunnel toward a light.

Yes, and it must have been an instance of spiritual transfer to an after-death world

Yes, but it was probably just an illusion, perhaps induced by sudden physiological changes

No

Q17. When I was a child I thought I had lived as a different person in another time and place.

Yes, and it must have been an instance of reincarnation

Yes, but it was probably just an illusion or wishful fantasy

No

Q18. I have inherent abilities that neither of my (biological) parents possessed.

Yes, and these abilities I must have possessed in a previous lifetime or incarnation

Yes, probably because my life experience has differed from that of my parents

No, or don't know

Q19. While alone in bed at night I have felt someone or something touch me, but when I switched on the light there was nobody else there.

Yes, and it must have been an instance of a ghost or a demon

Yes, but it was probably just an illusion or dream, perhaps caused by anxiety

No

Q20. In magazines I read, the horoscope for my star sign usually turns out to be accurate.

Yes, because astronomical phenomena have paranormal influences on human life

Yes, but astrologers' statements are often true of anyone, regardless of star sign

No, or don't know

In the study of Launer and Cetin (2023), anticipation was reduced to three important questions. Anticipation (Pre-Cognition):

- I have a premonition of what is going to happen.

- I can foresee the outcome of a process.

- I foresee how to decide before I review all aspects

The common item selection studies mentioned anticipation in terms of

- Experiental Hunches in REI by Pacini / Epstein (1999)

- Emotional Hunches in PMPI by Burns / D´Zurilla (1999)

- Affective Hunches in TIntS by Pretz et al (2014)

- Affective Hunches by USID by Pachur / Spaar (2015)

The typical items is:

- I believe in trusting my hunches

Conclusion

The study shows the theory and items for empirical studies for the anticipative intuition based on the concepts of hunches, pre-cognition, and pre-monition. It can be used in future studies.

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Diversity and Women Empowerment

Econometric Analysis of Gender Presence and Performance of Women in the Workplace in Cameroon (Sub-Saharan Africa)

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Abstract

This study research paper investigates how gender discrimination affects corporate performance in Cameroon. Data from the Cameroon Enterprise Survey in 2016 by the World Bank Group and data collected from March 6 to 23rd, 2023, in Douala and Yaoundé, as well as 757 managers' responses, were utilized. The analysis focused on three organizational levels: employees, management, and business ownership. This study used a mixed method of descriptive and econometric analysis. The results of this study revealed a positive and significant relationship between the presence of women in the workforce and performance. This result is attributed to the improvement in the performance of enterprises with appreciable participation of women in the workforce, management, and ownership levels, specifically in the tourism industry, arts and crafts, textiles, general merchandising, and distribution, which require less training and funding, which are the principal factors of discrimination against women and girls in Cameroon. Furthermore, the turnover of businesses owned and managed by women and those owned/operated by men shows successful growth compared to companies of similar sizes**.**

Key Words: gender equality, corporate performance, business. econometric analysis

Introduction

A growing emphasis on Corporate Social Responsibility (C.S.R.) highlights the professional equality between men and women in the corporate world. Owing to the complexity of the workplace, diversity and inclusion have been questioned. This study argues that gender equality has become a moral and strategic necessity for corporate competition. The compelling evidence from our research leaves no doubt about the strategic advantage that gender equality can bring to corporate performance. The International Labor Organization narrated in its Global Wage Report 2018/19 that women earn 20% less than men do globally (International Labor Organization, 2018). Moreover, women's labor force participation rate is 26.5 percent lower than men's. Women are underrepresented in C.E.O. (chief executive officer) positions and board seats despite several studies signifying a robust positive correlation between gender diversity in the corporate world (Taghizadeh-Hesary et al., 2019). This

study further reinforces this correlation by highlighting the significant Impact of gender diversity on corporate performance.

Globalization has created genuine concern for interacting with organizations (businesses) and their environment. Corporate Social Responsibility has been the emphasis that brings to light the professional equality between men and women in the corporate world. Indeed, several empirical investigations, particularly in developing countries such as Cameroon, have highlighted the effects of gender equality through women's participation in the prosperity of businesses. Thus, gender equality is imperative for corporate competition. One study shows that if a company reduces obstacles to women's ascension in business, it will benefit growth, performance, and productivity (Burke & Davidson, 1994). Gender equality can be an economic and managerial issue beyond being a factor of social dynamism. There has been an increasing debate on the qualities of feminine behavior as a vector of collective performance in businesses. However, there has always been a stereotype that a man will earn for the family, and a woman, on the other hand, is expected to stay indoors looking after the family responsibilities. After a long struggle, women were considered only to look after the family.

Today, female entrepreneurs make up about one-third of the world's entrepreneurs; however, in Africa, the situation still needs to be more encouraging for female entrepreneurs than for men, considering the worse conditions in Cameroon. Indeed, the stereotype belief that women are to take care of family responsibilities only has created gender disparity in enterprises between women and men, most of which are in terms of the functions they perform, the sector of activity, or the wage rate and compensation they receive. According to data, women constitute one-third of the world's workforce, about 46%, compared to 72% of men, according to the International Labour Organization (I.L.O.) 2016. In sub-Saharan Africa, there is a global gap of 17 percentage points between the participation rate in the active population of women and that of men, which are 53% and 70%, respectively (World Bank, 2015). In Cameroon, the results of the second General Census of Enterprises, known in French as Recensement Genrale des entreprise 2eme edition (RGE-2), conducted in 2016 by the National Institute of Statistics (I.N.S.), indicate that compared to men, women are still less likely to be employed in companies. In a country like Cameroon, with a female population of over 51%, only 43% of women are engaged in companies, and only 44% hold a permanent job. This difference in participation is also noticeable when examining business size. Cameroon, a patriarchal society, has a ratio of one woman to six men in large businesses and a ratio of one woman to two men in small and medium-sized enterprises. A look at entrepreneurship reveals more gender disparities in Cameroonian companies (62.8% of businesses are created by men compared to only 37.2% by women).

Regarding management, 57.3% of the companies are run by men and 42.7% by women. Gender attitudes and practices in Cameroon's labor market are rooted in the traditional patriarchal system. They are reinforced by modern legal and political instruments that limit women's economic advancement. Although the employment trends of women have improved (RGE2), the sociological,

legal, and cultural burdens still relegate Cameroonian women to second place by reducing their activities, primarily to fulfill family commitments and maternity constraints. A solid cultural attachment is observed in these areas compared to urbanities due to the progressive enlightenment of females and the significant emergence of government policies; prejudices, traditions, and customs still limit women's employment in companies, their promotion to managerial positions, and even the ownership of startups and the creation of enterprises. Beyond these socio-cultural barriers are economic barriers, including lack of equity (in terms of training) and lack of access to institutional credit, severely limiting women's entrepreneurship in Cameroon. These barriers amply testify to the persistence of disparities in participation by gender in the labor market in general and in business in Cameroon. For the proper functioning and participation of all Cameroonians in the economic development of Cameroon, it is essential to nurture and encourage potential without gender discrimination.

Cameroon, a patriarchal society, has a ratio of one woman to six men in large businesses and a ratio of one woman to two men in small and medium-sized enterprises. A look at entrepreneurship reveals more gender disparities in Cameroonian companies (62.8% of businesses are created by men compared to only 37.2% by women). Regarding management, 57.3% of the companies are run by men, and women run 42.7%. Gender attitudes and practices in the labor market in Cameroon are rooted in the traditional patriarchal system that limits the economic advancement of women. Although the employment trends of women have improved (RGE2), the sociological and cultural burdens still relegate Cameroonian women to second place by reducing their activities, primarily to fulfill family commitments and maternity constraints. Robust cultural attachment was observed in rural areas compared to urban cities.

Government policies, prejudices, traditions, and customs limit women's employment in companies and promotion to managerial positions. Beyond these socio-cultural barriers are economic barriers, including a lack of equity and access to institutional credit, severely limiting women's entrepreneurship in Cameroon. These barriers amply testify to the persistence of disparities in participation by gender in the labor market in general and in business in Cameroon (I.M.F. Report, 2015).

Public authorities have made efforts in favor of gender equality and the advancement of women to achieve not only Millennium Development Goals 1 and 3 (M.D.G.s) but, more generally, Objectives 5 and 101 of the Sustainable Development Goals (S.D.G.s) adopted by the General Assembly of the United Nations, aimed at ensuring equal opportunities between women and men in all sectors, particularly in the field of employment, despite a set of legal and regulatory mechanisms, consisting not only of national legislation but also of international and regional legal instruments aimed at promoting and protecting women's rights in the labor market and income-generating activities. Professional equality remains challenging for Cameroonian authorities, who continue developing strategies to encourage more women to participate in business. From this perspective, an action plan for the development of female entrepreneurship (PAN-DEV) will be published under the aegis

of the Ministry for the Promotion of Women and the Family, known by its French acronym (MINPROFF) (Efogo & Timba, 2015), meaning Ministere de Promotion de la femme et de la famile created in 2004 to encourage and promote women's participation in the social, economic, and political life of the country, acknowledging their potential. In addition to these government structures, informal structures such as tontines (community, business, or friends) and professional environments (colleagues, customers, and suppliers) support female entrepreneurship in Cameroon. These initiatives are strictly private and benefit from little or no government support.

This work seeks to attempt an answer to the following research questions.

1) How do women as part of the workforce in a business affect the performance?
2) How do women in management positions influence performance?
3) Are there differences in performance gaps between male-owned and female-owned enterprises of similar size?
4) What econometric analysis model is recommended to affirm the association between gender equality and corporate performance?

The following are the hypothesis statements of the study:

H1: If gender-based discrimination is resolved, corporate performance improves.

H2: Equal training and funding access for female entrepreneurs can improve corporate performance.

H3: Do female entrepreneurs perform better than male entrepreneurs at an equal level?

Methodology

This study used a descriptive and causal-comparative research design to analyze the effect of gender discrimination on employee performance in selected sectors in Douala, Yaoundé, and Cameroon. A descriptive study was undertaken to explain the variables and their characteristics that affect corporate performance through a questionnaire and econometric analysis.

The causal-comparative design examines the potential causes for observed differences among existing groups (Fulmer, 2018) and determines whether the independent variable affects the dependent variable (Jason & Rumrill, 2004). The cause-and-effect relationship between this study's dependent and independent variables was analyzed using causal analysis.

Data from Kiva and USAID on global gender lens investing were utilized to verify the first hypothesis (H1: if gender discrimination is resolved, corporate performance can improve) and the second hypothesis (H2: equal access to female entrepreneur training and funding can improve corporate performance).

The analytical approach inspired by the works of William H. Greene and F & D, while taking into consideration the context of sub-Saharan Africa (Cameroon), was adopted to verify the first hypothesis (H1: If gender-based discrimination is resolved, then corporate performance will improve) Moreover, the second hypothesis (H2 equal access to training and funding of female entrepreneurs can enhance corporate version). However, this approach does not make it easy to

affirm with certainty that gender equality is the cause of the company's positive performance; it only makes it possible to establish a clear link between the feminization of the company and its performance.

A total of 757 managers from seven (7) selected industries from Doula and Yaoundé were chosen as the study's respondents. These respondents were chosen based on their visibly established enterprises, imperative registration on the trade and personal property credit register, and registration in the taxation department. Some are members of enterprises in Cameroon known in French as "*Groupement International du Cameroun*" (GICAM). Thus, the respondents were sufficiently representative. The industries are brewery, arts, craft, livestock and fishery, General Merchandise, banking, microfinance, insurance, hair salons, fashion, and Leisure and Tourism.

The data presented in this work were derived from research inquiries conducted in Douala and Yaoundé of the Republic of Cameroon from March 6 to March 23, 2023. According to the general Census of Enterprises (R.G.E.) conducted by the National Institute of Statistics (I.N.S.) in 2009, more than 60% of the total number of enterprises in Cameroon are found in Douala and Yaoundé. These two cities are the political capital (Yaoundé) and the economic capital (Douala) of Cameroon. This figure provides a consequential image of the financial presentations of enterprises in Cameroon. It also provides an idea of the demographic presentation of the country, with these two cities having a population of over 9 million or approximately ¾ of the country's total population (about 25 million). We interviewed 757 enterprises in different sectors and industries in the country. Our objective was based on the budget and time required to conduct this study. According to data from the National Statistics Institute, approximately 35.1% of enterprises are in Douala and 23.9% in Yaoundé.

Table 1.0: *Respondents Population*

Industry/subsector	Douala	Yaoundé	Total
Brewery	51	40	91
Arts & craft	75	40	115
Livestock & fishery	30	10	40
General Merchandising	150	115	265
Banking, microfinance & Insurance	15	10	25
Hair salon & fashion	60	55	115
Leisure & tourism	46	60	106

Results and Discussion

The data were processed using frequency statistics, and thematic analysis was employed to identify the relationship between gender equality and corporate performance. The models are the most appropriate for use because they perfectly link various economic variables to each other. This model provides a formal approach to estimating how a change in the explanatory variable affects the explained variable, the dependent variable, considering the Impact of all other determinants of the dependent variable—a linear regression model for the variables in this study as defined.

Y=αX + ε

Y= independent variable (business performance)

X= vector of the dependent variable (gender inequality)

α= vector associated with the parameter to estimate

ε= error margin or residue

The following equation specifies the basic econometric model presented above.

$$\gamma_f = \pi + \propto x_f + \propto VF + \varepsilon$$

y_f = Profit margins and returns on investments represent business performance variables.

$\propto x_f$ = Exponential variable of sex gender discrimination of females.

$\propto V.$ F. Vector of fixed or control variables.

ε= error terms.

The measures of the variables are mentioned above and explained in detail below. See the section devoted to explaining or describing this study's variables.

The 3rd hypothesis (H3: Turnover between men-owned businesses and women-owned businesses shows successful growth when comparing companies of similar sizes) can be verified by adopting Robert W. Fairlie and Alicia M. Robb (2008) and Essus et al. (2018) to explain the performance gap between female- and male-owned businesses of similar sizes in the Cameroonian context. The standard blinder Oaxaca decomposition is used with the marginal effect from the logit specifications for closure, profitability, and employability coefficients for linear log sales specifications. These methods can be criticized for their lack of preference and the impossibility of establishing a coherent relationship between the standards and nature of average-based analysis. However, the technique produces very robust results that favor its wide use in exploring certain factors to explain inequalities related to wages, employment, and productivity, as well as the production gap between men and women in the labor market (Oaxaca, 1973; Fortin, 2011)

Therefore, we can estimate the performance matrix of female-owned businesses as follows:

$$(x + a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k}$$

$$Y = \beta + \sum_{j-1}^{j} \beta \times + \in$$

Y= log of business performance held by women

β= vector of the coefficient to be estimated.

X= matrix of the explanatory or independent variable restrained in the model specifications

ϵ= error term

Description of Variables

Response or Dependent Variable.

Business performance is the dependent variable in this study. Business performance is usually measured using indicators such as return on assets (ROA), return on equity (R.O.E.), return on sales (R.O.S.), profit margin, revenue, and revenue others (Kim et al., 2020).

The key performance indicators gauge a company's overall long-term performance. They help determine strategic, financial, and operational achievements compared with businesses of the same size and sector. Large companies' performance indicators are often measured regarding return on investment, profit margins, and revenue.

Return on assets (ROA), return on equity (R.O.E.), and return on sales (R.O.S.) are criticized because they present performance of the past, which is somehow good if the present concerns, such as profit margin, return on investments, revenue, growth in turnover, and employment as short-term and long-term performance. These performance indicators are easy to obtain and facilitate accessibility of business performance information. These variables are considered objective performance indicators (Delmar, 1997), and they are also regarded as indicators of entrepreneurial success, according to Dunkelberge and Cooper (1982). The data presented in this study provides information on the profit margin, return on investments, employee growth, and annual turnover. A business with temporary part-time or seasonal jobs was challenging to differentiate from this study because of its economic level. Difficulties accessing information on employees, annual sales, and total assets seem complicated due to tax evasion; companies keep this information confidential and secret.

Accessing this information was impossible because it cannot be found online and can only be obtained from the financial departments of various companies. Due to complicated tax policies, companies and businesses keep this information secret to avoid increased taxes. It becomes difficult to calculate the performance measures of most companies with certainty. Due to administrative tolerance and a lack of transparency in the archives of social security funds, it is difficult to know the exact number of employees in companies/businesses.

Explanatory or Independent Variables

The main aim of this work is women's participation and its Impact on business performance in Cameroon. In other words, we examine the Impact of gender discrimination on corporate performance. The analysis can be observed at various levels: the significant elements of discrimination, the effects of these discriminations on performance, and the gap between male- and female-owned businesses. Differences exist between people's behaviors, and how these behaviors affect business performance remains an object of debate. Social science considers gender differences in behavior as a vector of collective business success and can favor access to career evolution and acquisition of experience (Del Giudice, 2015). Access to credit and training are the

variables that indicate whether credit is obtained to fund the business and whether the employee or the management has the required training. The indicator of a company that benefited from credit could be 1, and 0 for those that did not. Unlike male-owned businesses, female-owned businesses usually face difficulties obtaining credit from institutions during their startup, survival, and growth stages. Due to these difficulties, examining the variables concerning self-financing companies using the owners' funds is imperative. The employees' and management's training and skills are independent of this study, as they constitute an element of discrimination.

The physical presence of women is essential for business performance because of the difference in behavior between women and men, which is visible and has been an object of debate in the social sciences. Most social science studies have established that the differences in behavior between women and men are significant vectors for collective success in an organization. In this study, the presence of women was an essential aspect of business. Certain feminine qualities could also influence a company's collective performance. This feminine quality has been considered in several studies to contribute to women's teamwork performance, which is one of the essential aspects of company performance. These feminine qualities can be a leg for those who think gender equality could impact corporate performance. The education and funding of female entrepreneurs in Cameroon could boost the economy's emergence.

Here, the variables of the workers' and management's training and skills are independent of this study, as they constitute discrimination.

Fixed or control variables

The control variable was something held constant. This section tries to identify and explain the fixed variables used in this study. In the context of Cameroon, gender discrimination and business performance could have several selected or control variables, such as professional experience, age of the company, political policy, registration, and others.

According to the human capital theory, resources and skills are essential for business performance. The professional experience of management and workers is an important variable in this study; the accumulation of experience and knowledge by management and employees is essential for the company's performance. The works of (Westphal and Zajac, 1995, and Terjesen et al. 2008) opine that women can accumulate valuable experience as managers of small and medium-sized enterprises. Knowledge and understanding of the employee and the manager, especially participation in performance, are usually measured by annual profit margin, company sales growth, and others. Increasing the professional experience and knowledge of the executive leads to improved performance. Another fixed variable is the age of the business, which is the time the industry has been operating. The company's age is an essential variable in business performance (M'hamid et al., 2011).

Business size was also a variable that should be considered in this study. The number of employees measures a company's operating capital and financial capacity. The feminine quality of

accountability places women in an advantageous position to run and manage large companies. Big companies rely on responsibility for better performance. Companies in some sectors require more guilt than others do. Thus, the sector in which the business operates is a valuable fixed variable that can affect performance. The significant rise in the involvement of women and girls in the corporate world in Cameroon over the past few years is a testament to the government's proactive measures and the emergence of rights groups. These entities have been instrumental in raising awareness about the crucial role of women and girls in the country's economic growth. The age of a business is a crucial fixed variable that warrants investigation when analyzing a company's performance. This factor can provide valuable insights into the company's growth trajectory and potential for success. The official registration of the company, losses due to theft, investment in security, power outage, possession of an electricity generator, and advice on the management of activities are all dichotomous control variables used in this analysis.

Discussion

Profile of Respondents

There were 450 enterprises owned or managed by men and 307 enterprises owned and controlled by women. The ages ranged from 17 to 60 for men and between 16 and 62 for women, with a total of 757, commonly 51.5% single and 27% married.

In Cameroon, traditional African marriages are the predominant mode of marriage. Most marriages in Cameroon are not registered in the civil status registry and are thus considered free unions. This is because of the cumbersome procedure for registering marriages in the civil status registry. However, the government occasionally organizes collective marriages to encourage free unions to register their marriages. It explains The marital status of the respondents figured in question 3 of the questionnaire, with the respondents having to choose whether they were single (120 respondents), married (205 respondents), divorced (42 respondents), widowers (0 respondents), or free union (390 respondents).

Respondents' educational attainment was 28%, and they had the highest diploma. Due to the stereotypical nature of Cameroonian society, women and girls do not have access to education as their male counterparts do. The research reveals that most interviewees have yet to reach their education level, as most have just gone through primary school. Two thousand ten of those interviewed had no level of education: 167 went through elementary school, 188 went through middle school, ninety-eight through high school, and 94 went through higher education. A business's performance and operating mode would be much better with formal education. Most women in Cameroon companies serve as a workforce, and their recruitment is based on tribal lineage, sociological acquaintances, and family ties. Education and training are usually minor priorities when working in or managing a business in Cameroon. There is a tradition of training a child of the family or the village in the trade in which one operates to pass down the experience and knowledge to the child within a period of usually seven years and then settles the child by opening the same kind of

business for him to establish him as a compensation for serving the master for seven years. Influences children to join their relatives and tribes' men in the cities immediately after elementary studies to indulge in businesses, abandoning formal education. However, formal education is necessary in highly skilled sectors like banking, insurance, engineering, and other industries. Thus, such practices are infrequent in these sectors, although traces of tribalism and other counterproductive attitudes can still be found.

The data indicate that the business owner or manager has acquired complementary training. The results revealed that none (0%) of those interviewed had acquired professional training. In comparison, 230 (31%) had apprenticeship training or apprentices in the enterprises where they worked, and 25 (3%) had formal training in secretarial, electricity, engineering, and others. In comparison, 502 (66%) samples did not undergo training.

Degree of interference of the family in the enterprise.

The Degree to which family members interfere in the enterprise can be seen in multiple ways, either by financing, which is usually not the case, or by dependence upon the business as a source of support (Qiu & Freel, 2019). This indicator affects men as they are usually the breadwinner of their families. Families depend on the business's profits for their livelihood, making it difficult for owners to plow back profits, thereby increasing performance. In most cases, women are more likely to push back profits, making their performance higher than their male counterparts.

Impact of environment on performance

The environment here refers to extended families, friends, neighbors, and the community in which they operate. Some settings have a positive impact on performance, whereas others harm it. Those working in a vulnerable and underprivileged environment turn to conducting more corporate social responsibilities and spending more money on charity and social activities without profit. In contrast, middle—or upper-class people pay less for social activities and plow back profits.

Zone inquiry

This indicates the geographical zone in which the interviews were conducted. The areas of inquiry in this study were Douala and Yaoundé. According to data from the general census of enterprises in 2006, these two cities constituted approximately 60% of the total number of registered enterprises in Cameroon. Yaoundé is Cameroon's political capital, while Douala is Cameroon's economic capital.

Subsector.

It is part of a more significant sector, a branch of the industry. For example, the general merchandising sector may consist of retailers specializing in selling different items, such as groceries, furniture, and other commodities.

Employee Apprentice.

The questionnaire survey indicated that most of the enterprises interviewed operated in the fields of brewery, arts and craft, livestock and fishery, general merchandising, banking and finance, hair salons, fashion, leisure, and tourism—employee apprenticeship, which is the process of acquiring acquisition valuable experience in a particular domain to gain expertise. Most of the sectors of the Cameroonian economy require practical knowledge and expertise to be able to perform. Employees must undergo apprenticeships in industries such as hair salons. In this situation, the employee must sometimes pay the employer for training in banking and finance, tourism, leisure, insurance, brewery, and other related industries. The employer benefits by equipping the employee with the necessary skills to perform, sponsoring the employee's apprenticeship, and making it easier to acquire the skills. Women are often excluded from internships in the enterprises mentioned above because of family constraints and maternity holidays; meanwhile, they are the dominant apprentices in enterprises where apprenticeship is paid.

This affirmation can be verified in the study of informal vocational training and sustainable livelihood skills among unemployed youth in low-income countries: insights from a SWOT analysis of tailoring apprenticeships in Cameroon by Ijang Bih Ngyah and Etta Mercy Aki.

Access to Bank Loans.

This question aims to determine the frequency with which enterprises go for bank loans and how accessible these loans are to enterprises. The most common conditions for obtaining a bank loan in Cameroon are providing collateral or having a guarantor ("shorter"). Valuable collateral securities for bank loans are landed and have movable properties, e.g., cars. Women need more access to land properties, making it extremely difficult to obtain independent bank loans. Thus, they require approval from their husbands, who are loan guarantors. Unmarried women are required to bring a family member or relative with stable employment, and, in most cases, the bank will require the guarantor's salary to pass through their bank for the duration of the loan. Obtaining bank loans is cumbersome for female entrepreneurs, especially startups. Sometimes, bank loans for small and medium-sized enterprises do not excite 12 monthly installments.

However, the need for external funding has imposed a sense of community cooperation among startups. These startups come together and contribute a certain amount monthly to fund one member. This funding will rotate until all members are equally supported. This process of community funding is known as the tontine in Cameroonian jargon.

In very few cases, startups or enterprises receive funding from non-governmental organizations, goodwill individuals, and charity organizations. These findings are usually scarce and apply to enterprises in the agricultural sector. In sporadic cases, enterprises attempting to go bankrupt can benefit from this funding. Related studies on this effect could examine credit access in Cameroon and diaspora investors' access to bank credit in Cameroon.

Client's accessibility behavior.

This question aims to determine the enterprise's accessibility to clients or potential clients. It seeks to determine how the position of the business location influences the performance. Certain enterprises, like the tourism and leisure industries, do not have problems establishing their enterprises. What is of prime importance to them is the advertisement and quality of services they offer; meanwhile, in other sectors such as general merchandising, location, and accessibility are very important because regardless no of the quality of the product and service provided, if the business location is not accessible to clients, potential clients will not come. Table of correlation between the presence of women workforce and management/ownership and performance.

Table 2.0: *Correlation between the presence of women workforce and management/ownership and performance.*

Performance Indicators	Workforce		Manager/ Owner	
	Women	Men	Women	Men
Return on assets (ROA).	200/307	239/450	188/307	300/450
Return on sales (R.O.S.).	200/307	239/450	188/307	300/450
Return on equity (R.O.E.).	200/307	239/450	188/307	300/450
Profit margin.	0	0	0	0
Funding.	0	0	87/307	450/450
Complementary training	169/757	437/757	106/307	317/450

Data analysis and performance indices (P.I.) presentation per company category.

This part of the study compares companies/businesses owned by women and men in selected sectors in which data were collected. The sectors chosen were general merchandising and distribution, arts and crafts, and tourism and leisure.

The data demonstrate that these sectors were selected based on their popularity in Cameroonian society: general merchandising and distribution (265 samples), arts and crafts (115 models), and tourism and leisure (106 pieces).

The table below shows the comparison, with sex and performance indices (second.) as the main variables and classified from first to fourth. The first category represents $one \leq PI fourth 5$, [2nd] category $1.5 \leq PI \leq 2$, 3rd category, $2 \leq PI \leq 2.5$, 4th category, $2.5 \leq PI \leq 3$. The various categories of performance indices are based on return on assets, equity, sales, and profit margins. The profit margin is the most common indicator measured in finance. Employee growth and stock are also indicators of interest. Due to difficulties evaluating other growth aspects, we emphasize the profit margin in financial terms. Category 1 enterprises have a profit margin between USD 2000 and USD 3000. By contrast, category two enterprises have a profit margin between USD 3000 and USD 4000. Category 3 enterprises have a profit margin between USD 4000 to USD 5000, and Category 4 enterprises have a profit margin between USD 5000 to USD 6000.   The sex remained male and

female, while the performance indices were evaluated on a scale from 1 to 3. The tables are presented in Tables 1 and 2,3,4, with Table 4 demonstrating the percentage of the general data collected and Table 1,2,3 representing the selected sectors' data. Table of Sex Variables and Performance Indices per category in the Distribution and General Commerce industry.

Table 3: *General Merchandising/performance indices (P.I.) 265 samples*

		1st	2nd	3rd	4th	Total
Sex	Male	0.0	34	85	12	131
	Female	0.0	51	75	8	134
Total		0.0	109	136	20	265

The above table indicates that of the 265 enterprises interviewed, none made a profit, as shown by the monthly performance indices of USD 2000 to USD 3000. Thus, 0.0%. This observation could explain why general merchandising requires enormous capital to run businesses and operate efficiently in this sector. The targets in this sector were enterprises registered in the trade and registry. In that access, essential information on return on sales, return on assets, return on equity, and other factors was provided. This can be easily obtained. The figures were obtained by finding the percentage of each category from the total number of male and female-owed/managed enterprises in the performance category, as shown in the table above. On the other hand, there were 34 male-owned or managed enterprises for the second category, 85 for the third category, and 12 for the fourth category. On the other hand, the female-owned or ordered enterprises for the second category, seventy-five for the third category, and 8 for the fourth category, which makes a total of 134 enterprises in this sector managed by women against 131 operated by men.

Table 4.0: *Performance indices per category for Arts and crafts, 115 samples*

		1st	2nd	3rd	4th	Total
Sex	Male	17	24	49	0	52
	Female	8	40	15	0	63
Total		25	64	26	0	115

The total number of enterprises interviewed in the arts and craft sector was 115, 52 of which were managed/owned by men, while sixty-three were held/managed by females. None of the enterprises in this sector made a monthly profit margin of USD 5000. For this sector's male-owned or managed enterprises, Category 1 had 17 enterprises, Category 2 had 24, and Category 3 had 49 enterprises. On the other hand, for female-owned or managed enterprises, the first category had eight enterprises, the second had 40, and the 3rd 15, making 63 enterprises owned/operated by females.

Table 5.
Performance indices per category for the tourism and leisure industry (106 samples).

		1st	2nd	3rd	4th	Total
Sex	**Male**	3	16	33	3	55
	Female	3	20	23	5	51

Total	6	36	56	8	106

The above figures are obtained by calculating the sum of each variable's sex and performance indices from the indicated sector or industry from the data collected. A simple addition of the total will give 100%. The calculations were performed to minimize the error margin.

A table of the performance indices of the total number of questionnaires collected in the field shows the overall performance of the companies or enterprises concerning the gender of the owner or manager. For the first category, there is a relative increase in the performance of male-owed/managed companies. However, as the class increases, we observe a rapid change in business performance, favoring female-owned/operated businesses. This indicates that if female-owned businesses are funded or have access to funding and adequate training, they can perform better. With limited training and lack of access to funding, female-owned/managed businesses of comparable size to male-owned/managed businesses still stand out, irrespective of the numerous discriminations they face. The table below demonstrates the performance indices per category of the questionnaires and data collected in the field.

Table 6.
General performance indices of the questionnaires studied (757 samples)

		1st	2nd	3rd	4th
Sex	Male	1.7%	34.5%	54.8%	9.0%
	Female	1.0%	26.2%	57.1%	15.7%
Total		1.4%	31.0%	55.8%	11.8%

Conclusion and Recommendation

Thus, there is a positive and meaningful relationship between the presence of women in the workforce and performance. There is also a positive and meaningful relationship between the presence of women in management positions, board of directors, and company performance. The turnover of businesses owned and managed by women and those owned/operated by men shows successful growth compared to similar companies**.**

Therefore, this study recommends improving women's, girls', and female entrepreneurs' access to training and funding to equip them with the necessary skills to enhance their performance. Gender awareness needs to be improved to reduce the stereotypes and macho mindsets that make men uncomfortable working under women's management.

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Financial Literacy in Investment Decisions of Working Womem

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Introduction

Financial literacy is more essential than ever in an era of swift technological advancement, globalization, and fluctuating economies (Valladares, 2020). Financial resilience and well-being are largely dependent on financial literacy, which is commonly understood to be the capacity to comprehend and manage one's finances (Kumar et al., 2023). It covers a broad spectrum of skills and information, such as retirement planning, debt management, investing, saving, and budgeting (Sahadeo, 2018). Despite its significance, research shows that a large section of the world's population lacks adequate financial literacy, which has negative effects on people individually, in families, and on society at large (Garg & Singh, 2018).

Financial literacy includes a deeper comprehension of intricate financial terms and their practical applications (Matheson, 2019). It goes beyond simply knowing how to calculate interest rates and balance a checkbook. It entails understanding the effects of financial actions, weighing the benefits and risks, and making well-informed decisions consistent with one's beliefs and financial objectives (Kumar et al., 2023). Furthermore, financial literacy encompasses broader societal variables, including economic policies, regulatory frameworks, and access to financial products, in addition to individual behavior (Stolper & Walter, 2017).

Gender differences are especially evident in the area of financial literacy. Several studies have demonstrated that women generally have lower financial literacy skills than males (Lusardi, 2019). There are ample reasons for this gender disparity in financial literacy, including access to financial resources, educational opportunities, and cultural norms. Also, it is vital to address women's literacy because they frequently confront particular financial obstacles, such as the gender wage gap, caregiving obligations, and longer expectancies of life (Ophir & Polos, 2022).

Improving the financial literacy of women serves as a vehicle for social advancement and gender equality alongwith economic empowerment (Ndung'u, 2021). Women who possess the knowledge and abilities to handle their money wisely will find it easier to become financially independent, pursue job possibilities, and provide for their family (LeBaron et al., 2018). Women who possess financial literacy are also better equipped to speak up for their rights, take part in economic decision-making, and remove structural obstacles that prevent them from being financially included (Klapper & Lusardi, 2020).

Financial literacy is a problem that needs to be solved in a multidimensional way that includes community empowerment, policy interventions, and education (Goyal & Kumar, 2021). Building basic knowledge and abilities is facilitated by educational initiatives, which can range from adult financial literacy programs to curriculum based in schools (Totenhagen et al., 2015). Filling the gender gap in financial literacy also requires actions to promote gender-sensitive policies, expand financial inclusion, and make cheap financial services accessible (Sharma, 2020).

Financial literacy is essential to both societal advancement and economic empowerment. Individuals, especially women, are better able to make decisions that improve their financial well-being and contribute to greater economic stability when they have the information and abilities to successfully manage the complexity of personal finance. Financial literacy enables people to take charge of their financial destinies, pursue their goals, and overcome economic challenges—from budgeting and saving to investing and retirement planning. More gender equality and economic opportunity can also be fostered by tackling the gender gap in financial knowledge and supporting inclusive educational programs. Hence, financial literacy investments are a means to a more robust, equitable, and prosperous society for all, as well as an investment in personal prosperity. The rationale for this research lies in the critical relevance of financial literacy in navigating today's complex economic landscape. It is imperative to tackle the pervasive deficiency of financial literacy, especially among females, in order to promote personal welfare, social progress, and financial stability. Through a variety of strategies, such as education and policy interventions, the research tends to increase financial literacy and empower people while promoting a more just and prosperous society.

Review of Literature

Scholars have focused a great deal of attention on the importance of financial literacy in achieving economic empowerment, and a growing body of research has examined how it influences financial decisions and behaviors across a range of populations. Dam & Hotwani (2018) developed a thorough scale that incorporates important components such as risk assessment, retirement planning, financial planning, and investment planning, providing a strong instrument for assessing financial literacy. Their methodical strategy to the development and improvement of items produced a trustworthy instrument for additional scholarly research.

Building on this basis, Grohmann (2018) investigated the degree of financial literacy in urban Asia, paying particular attention to Bangkok's middle-class citizens. The study revealed a noteworthy paradox: although the average level of financial literacy was on par with industrialized nations, there existed a large disparity in the comprehension of intricate financial ideas. This discrepancy emphasizes how important it is to raise financial literacy in order to make better financial decisions. Similar to this, Gangwar & Singh (2018) looked at the socioeconomic factors that influence adult Indian financial literacy. Their research revealed the glaring differences in financial literacy between various demographic groups and made a compelling case for focused interventions, especially for

the less fortunate. Gupta & Gupta (2018), whose study of rural Himachal Pradesh residents demonstrated how financial literacy influences investment decisions, further supported the significance of customized financial education by highlighting the need for specialized efforts to improve understanding and decision-making processes in these communities.

As evidenced by Mudzingiri et al. (2018), who looked at the variables influencing university students' financial behavior in South Africa, the importance of financial literacy transcends these situations. Their study provided important insights on how to help young adults to become financially literate by demonstrating the impact of risk perceptions and confidence levels on financial decision-making. Similar to this, Morgan & Trinh (2019) provided information on the financial literacy levels in Vietnam and Cambodia, highlighting the need for targeted interventions for vulnerable people and exposing the demographic and socioeconomic determinants influencing literacy outcomes. Santini et al.'s (2019) meta-analysis, which examined the causes and effects of financial literacy by discovering interactions between variables like gender, education, and financial behavior, contributes to this expanding conversation. This study has shown to be essential in comprehending the complex nature of financial literacy. Zulaithi et al.'s (2020) study on the financial behaviors of secondary school teachers in Jakarta, Indonesia, highlights the wider implications of raising financial literacy at all societal levels by demonstrating the favorable effects of financial literacy on investing and budgeting decisions. Azeez and Akhtar's (2021) research concentrated on digital financial literacy in rural India, namely in the district of Aligarh. They showed that demographic characteristics are important in determining one's understanding of digital finance. Their conclusions serve as a foundation for actions meant to fill in current knowledge gaps. Similarly, Brochado & Mendes (2021) provided a methodological road map for further research in this field with their systematic review, which emphasized the crucial connection between financial literacy and saves behavior.

Matey et al. (2021) further underscore the transformative potential of financial literacy programs by examining the impact of financial literacy instruction on the social and economic well-being of Ghanaian teachers. Their research provided useful advice for upcoming treatments and showed the significant influence that financial literacy can have on financial management abilities. By examining the cultural aspects of financial literacy, namely the gender gap in China's urban and rural areas, Preston et al. (2023) broadened the discussion and demonstrated the significant impact of cultural elements on financial literacy outcomes. Oppong et al. (2023) looked at the relationship between investment decisions, personal finance management, and financial literacy among Ghanaian private sector workers, delving deeper into the African setting. Their results indicated positive correlations between these characteristics, endorsing all-encompassing programs meant to foster inclusive economic growth and individual empowerment. With her research on the influence of financial literacy on Sri Lankan undergraduate students' investment decisions, Kumari (2020) made a further contribution to this topic by highlighting the necessity of extensive educational programs to promote well-informed financial decision-making. Last but not least, Singh & Raheja (2019) examined academicians' investing choices in Jalandhar, India, pinpointing the critical elements that influence

financial behavior, from investment knowledge to governmental regulations. Policymakers and educators can use their findings as a reference to better understand how financial literacy affects investment outcomes.

When combined, these studies show how complex financial literacy is and how it affects financial well-being and empowerment in a variety of contexts. In Southeast Asia's metropolitan areas as well as rural India and Africa, financial literacy is still essential for attaining just and sustainable economic growth.

Research Gap

There may not be many studies that explicitly address the financial literacy relevance in the life of working women, despite the necessity of financial literacy being recognized more and more. Research that has already been done may focus mostly on larger demographics or certain groups, which leaves a gap in one's knowledge of the demands and difficulties working women have.

Research frequently draws attention to the disparities in literacy between the genders, with research showing that women typically have lower levels than males. It's possible that not enough research has been done on the financial literacy of working women in particular, or how their financial responsibilities and employment status relate to their financial literacy and decision-making.

Although a lot of study has been done on the connection between investing decisions and financial literacy, there might not be enough information to apply to the particular situations faced by working women. When creating tailored interventions and financial education programs to meet the needs of this group, it is essential to comprehend how financial literacy influences investment decisions.

Working women frequently balance a variety of duties and obligations, such as managing finances, advancing their careers, and providing care for their families. When considering variables like risk tolerance, investment preferences, and long-term financial goals, there can be subtle differences in how their levels of financial literacy translate into investing decisions. These differences deserve more research.

In order to advance gender equality and economic empowerment, it is imperative that the research gap in financial literacy and investment decisions among working women be addressed. Policymakers, companies, and financial institutions can create plans to assist working women in reaching financial stability and independence by knowing the obstacles to financial literacy and the effects on investment behavior.

Methodology

The first objective is to assess the value that financial literacy holds for working women. It entails determining the degree of comprehension and expertise that women have in relation to financial matters. It tries to gauge their learning of financial planning, debt management, investing, saving, and budgeting.

The second objective is to determine the impact of financial literacy on investment decisions of working women. It focuses on investigating how it influences the investment decisions made by women. It involves analyzing whether those with higher financial literacy tend to make more informed and effective investment choices compared to those with lower financial literacy. The objective will help learn more about the connection between working women's investment activity and their financial literacy by looking at this influence.

The present paper's research technique takes a methodical approach to exploring and developing theoretical frameworks pertinent to the subject matter. The first step in answering the research question is to perform a thorough evaluation of literature, which has included theoretical works, empirical studies, and scholarly discourse. A critical synthesis has then been conducted to develop a theoretical framework that expands on and integrates preexisting ideas to offer a novel opinion on the topic being studied. Throughout this process, theoretical reasoning, comparative analysis, and, when possible, the examination of empirical evidence have been used to iteratively refine the theoretical framework. Throughout the research process, careful attention has been paid to transparency and rigor, with a focus on clearly articulating the rationale.

Discussion

The first objective of assessing the significance of financial literacy in working women's life aimed to provide insights into their comprehension and proficiency regarding various financial matters. The assessment encompassed key areas such as financial planning, debt management, investing, saving, and budgeting.

The findings revealed a spectrum of financial literacy among the working women. Some participants demonstrated a strong understanding and capability in managing their finances, while others exhibited limited knowledge in certain areas (Klapper & Lusardi, 2020). Financial planning emerged as a critical aspect, with varying levels of proficiency observed among participants. Those with a higher degree of financial literacy seemed to have well-defined financial goals and strategies to achieve them (Singla & Mallik, 2021). On the other hand, individuals with lower financial literacy levels may lack a structured approach to financial planning, potentially impacting their long-term financial stability (Setyorini et al., 2021). Debt management is another significant dimension of financial literacy assessed. Participants who are more financially literate have exhibited better management of debt, including understanding interest rates, repayment schedules, and strategies for debt reduction (Baidoo et al., 2020). In contrast, those with lesser levels may struggle to effectively manage debt, leading to potential financial strain (Rahman et al., 2021). Investing knowledge varied among participants, with some demonstrating a grasp of investment principles such as risk and return, asset allocation, and diversification (Nofsinger, 2017). Conversely, others showed limited understanding of investment options and associated risks, highlighting the need for education in this area (Atkinson et al., 2015). Saving habits have also been evaluated, with financially literate individuals demonstrating the ability to allocate resources effectively towards savings goals

(Mohammed et al., 2018). In contrast, those with lower financial literacy levels may face challenges in prioritizing savings and building emergency funds (Hilgert et al., 2023). Budgeting skills varied among participants, with some demonstrating proficiency in creating and adhering to a budget to manage expenses effectively (Barr & McClellan, 2018). However, others exhibited difficulties in budgeting, leading to potential overspending and financial instability.

The findings suggest less literacy of finance in women is heterogeneous, with some individuals possessing strong knowledge and skills, while others exhibit gaps in understanding finance related concepts and practices. The varying levels underscores the importance of targeted interventions to enhance financial education and empowerment among working women (Birochi & Pozzebon, 2016). By addressing knowledge gaps and providing resources for skill development, organizations and policymakers can support women in achieving financial independence and security. Furthermore, the findings emphasize the need for tailored financial literacy programs that address the specific needs and challenges faced by working women. These programs should focus on building foundational knowledge in areas such as financial planning, debt management, investing, saving, and budgeting, thereby equipping women with the tools and confidence for taking well informed decisions (Sherraden et al., 2018).

Overall, enhancing financial literacy is crucial for promoting economic empowerment, reducing financial vulnerability, and fostering long-term financial well-being. By investing in financial education initiatives, stakeholders can empower women to control their own financial futures and achieve their goals.

The second objective tends to examine the impact of financial literacy on investment decisions of working women. The preferences of working women in terms of investments are greatly influenced by their financial literacy magnitude. Higher literacy is associated with a more likelihood of having a diverse investment portfolio, which consists of a range of assets like stocks, bonds, mutual funds, and real estate (Fong et al., 2021). They are aware of the significance of distributing risk and long-term return maximization. Women who lack financial literacy, on the other hand, might prefer to adhere to safer but lower-yielding investment options or might decide not to invest at all because they lack knowledge or confidence (Baker et al., 2020). Working women who are financially knowledgeable are frequently driven by long-term financial objectives like saving for retirement, building wealth, and becoming financially independent. They understand that investment can help them increase their wealth and stabilize their finances (Haabazoka, 2019). They also recognize how inflation affects their savings and look for investment possibilities that outpace inflation for maintaining their money over time. Conversely, individuals with less financial literacy could invest only for unexpected expenses or pressing necessities rather than having a long-term plan for accumulating wealth (Ward & Lynch Jr, 2019). Working women who are financially literate frequently consult a range of sources when making investing decisions. These could include books, seminars, workshops, credible financial websites, and guidance from financial experts like planners and advisors (Crawley, 2012). They recognize that before making any investment decisions, careful

investigation and due diligence are necessary. Additionally, they may leverage financial news and analysis to stay informed about market trends and economic indicators that could impact their investments (Raza et al., 2023). Conversely, women with lower financial literacy may rely on limited or unreliable sources of information, such as friends, family, or hearsay, which may not provide them with the necessary knowledge to make informed decisions (Munakampe et al., 2018).

The goal of assessing how working women's financial literacy affects their investment decisions illuminates the vital role that financial education plays in enabling women to make wise and successful investment decisions. Policymakers, educators, and financial institutions can create focused strategies to increase financial literacy among women and thereby improve their financial well-being and economic empowerment by understanding how financial literacy influences investment preferences, reasons for investing, and sources of information (Assefa & Rao, 2018). Additionally, one can close the gender gap in investment participation and assist women in reaching their long-term financial objectives by supporting financial literacy efforts designed specifically to address the requirements and obstacles faced by working women.

Conclusion

The study's finding highlights the vitality that financial literacy holds and its significant influence on their financial empowerment and well-being. This study highlights the diverse range of financial knowledge and its consequences for women's financial prospects.

The results show that working women have varying degrees of financial literacy; some have gaps in their knowledge of important topics, while others show great financial management skills. In order to close knowledge gaps and improve financial empowerment, specific interventions are required in a number of critical areas, including budgeting, debt management, investing, saving, and financial planning.

Furthermore, the study emphasizes how important financial literacy is in influencing working women's investing preferences and decision-making. Long-term financial objectives, a more diversified investment portfolio, and well-informed decision-making are all correlated with higher financial literacy. Initiatives for targeted financial education can enable women to accomplish their financial goals and successfully negotiate challenging financial environments.

The implications drawn from this study emphasize the necessity of targeted interventions, collaboration among stakeholders, and ongoing assessment of financial literacy programs. By prioritizing financial education, policymakers, educators, financial institutions, employers, and community organizations can support working women in achieving greater financial resilience, independence, and prosperity.

In essence, addressing the research gap is not only a matter of economic imperative but also a fundamental step towards fostering gender equality and inclusive economic growth. Through financial empowerment and education, we can build a more just and successful society that benefits everyone.

Implications

The research's conclusion throw light on the varied state of working women's financial literacy and its significant ramifications for their financial empowerment and well-being. As covered in the sections before it, the evaluation showed that participants' understanding and skill in important areas like budgeting, debt management, investing, saving, and financial planning varied widely. These discoveries highlight how crucial it is to implement focused interventions meant to improve working women's financial empowerment and education. This segment delves into the consequences of the discoveries and provide feasible approaches for interested parties to tackle the recognized obstacles and prospects. By leveraging these implications, policymakers, educators, financial institutions, employers, and community organizations can collaborate to foster a more financially resilient and empowered female workforce.

Programs for financial education that are specifically designed are necessary, as seen by the disparities. Financial planning, debt management, investing, saving, and budgeting are just some areas where these programs ought to be tailored to the unique demands and difficulties that women encounter (Dwiastanti, 2015). Targeted interventions should be implemented by organizations and policymakers to improve working women's financial empowerment and literacy. Through knowledge gaps and skill development resources, these interventions can assist women in achieving increased stability and independence (Woodgate et al., 2017).

Working women can reduce risk and increase long-term profits by diversifying their investing portfolios. Initiatives taken should place a strong emphasis on the value of asset allocation and inform women about possibilities for investing that go beyond standard savings accounts (Lusardi & Mitchell, 2014). The financial education motive should be to help working women see their financial objectives from a long-term perspective. Prioritizing goals like retirement savings, wealth accumulation, and financial independence can encourage women to make well-informed investing choices that are consistent with their long-term goals (Tomar et al., 2021).

Enabling working women to obtain trustworthy financial information and advice is crucial for them to make well-informed investment choices. This entails making use of tools like financial websites, books, seminars, workshops, and the expert counsel of financial planners and counselors (Archuleta et al., 2021). Closing the gender gap in investment participation can be achieved by initiatives aimed at raising working women's financial literacy. Financial literacy programs support greater gender equality and economic empowerment by giving women the information and self-assurance to invest (Andriamahery & Qamruzzaman, 2022).

To support financial literacy initiatives for working women, stakeholders such as legislators, educators, financial institutions, employers, and community organizations should cooperate together. Stakeholders can develop comprehensive plans to enhance women's financial empowerment and well-being by combining their resources and expertise (World Health Organization, 2018). It is imperative to consistently assess the efficacy of financial literacy initiatives for employed women and modify them in response to feedback and changing need. Through

constant adaptation to evolving situations and new obstacles, interested parties may guarantee that their work stays significant and applicable in the long run (Latapí Agudelo et al., 2019). Stakeholders may enhance their literacy, confidence, and empowerment of women by putting these implications into practice. This will ultimately lead to better financial outcomes and increased economic stability (Wangui, 2018).

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Diversity-Equality-Inclusion Practices in Small and Medium-Sized Companies: a Study in 4 Countries

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Extended Abstract

Every individual deserves equal opportunities and equitable treatment in the workplace, regardless of their gender, race, ethnicity, religion, age, sexual orientation, or other differences.

It is, however, generally stated that many small and medium-sized companies (later SMEs) still lack the knowledge and resources to implement and monitor diversity, equality and inclusion of their staff (later DEI) effectively. Thus, suppliers to big companies that will need to report corporate social responsibility among other issues already by 2026 (or latest by 2029 for smaller companies; Allgeier and Fellmann, 2023) due to the Corporate Sustainability Reporting Directive would have no knowledge, skills, abilities, or resources to adopt the directive in practice or adhere to the national laws that are issued in relation to it.

In the SME context where resources are scarce and every headcount matters to maintain profitability, some paths such as e g utilisation of mentors to universally help with these issues is hard (Clarke-Sather, et al, 2011). Thus, we need to identify the elements of the specific SME context in Europe, as to realize what are the potential bottlenecks when managing DEI and what could be the untapped opportunities (O'Donovan, 2017; Masocha, 2019). Moreover, it would be important to simulate in practice the DEI management process, so that it would feel real, acceptable, and integral to European SMEs.

In a recent project we are conducting surveys about the DEI issues that underrepresented groups face, and about the nature of the SMEs who struggle the most to understand and implement DEI management. The joint report should identify gaps in different stakeholder groups' perspectives, name the major bottlenecks which make DEI management in the SMEs complex (Lopez-Torres, 2023), and set priorities to be developed in DEI management (Mansell et al., 2023). The blueprint will go through the extensive revision and critique by various SMEs, academics, and under-represented groups participating in the project, to ensure that it entirely meets SME and expectations in different countries.

With the first survey we study SME perspectives on DEI, and best practices and challenges SMEs face in DEI management. The second survey, for the under-represented groups, will answer the second research question *How do SME characteristics affect their sustainability actions in relation to diversity, equity, and inclusion* ensure equity and inclusion at work. The two surveys are made in four countries: Finland, Lithuania, Austria, and Germany.

 The first survey to the SMEs consisted of 39 questions, and the dependent variables have been chosen to affirm diversity, equity, and inclusion related practices. These variables are composite

variables which have been formed from sets of questions and response options by calculating the means of the variables. These should help us answer the first research question *How do SME characteristics affect their sustainability actions in relation to diversity, equity, and inclusion.* A total of 120 responses from the four countries were gathered during the summer of 2024. This sample size could be argued to be a statistically unviable representation of the population of the SMEs (altogether more than 4.6 million SMEs exist in these four countries), and the results should thus be interpreted with caution (Zondervan-Zwijnenburg and Rijshouwer, 2022).

An interesting trend was however found when comparing company size within the SME sample with the tendency of having DEI practices in place. *The results, despite the weaknesses of the study this far, indicate that as firm size decreases, companies are more likely to adopt equity-related practices. In other words, medium-sized firms are less likely to adopt various DEI practices than small and micro-sized firms.*

A second survey, to help us gain understanding *about what are the DEI related challenges that underrepresented groups are facing when seeking employment or at work in European SMEs*, has also been conducted in the same countries. Here, the survey gathered a total of 288 responses, and the analysis is ongoing (together with some qualitative data gathering); some indicative results will be presented in the conference.

As the SMEs constitute the backbone of the EU economy, the problems SMEs face that are related to social responsibility remain unsolved, partly due to lack of tools to educate graduates that could lead the change towards inclusion. Together, these studies will be used to generate a framework for a digital tool create at least a shared DEI standard around which the SMEs could develop their internal processes and strategies when implementing ESG requirements for social responsibility. A tool that resonates with the realities of the SMEs within the EU, and that could be used by the educators in their programs to develop graduates with the needed skills, may ensure that social challenges within the EU would be addressed through a holistic and achievable manner.

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Women in Digital: A Comparative Analysis of EU and Türkiye

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Purpose

The aim of this study is to evaluate the role and participation of women in the EU and Türkiye. We examined the correlation between internet usage rates and women working in the field of information and communication technologies (ICT) to analyse digital transformation process. In this context, the situation of Turkish women in ICT sector is compared with EU countries.

Theoretical Framework

Within the framework of the EU's "2030 Digital Compass" and the DESI data, the impact of digital transformation on human capital will be analyzed. In particular, the role of digital literacy in contributing to a qualified workforce in the digital economy is discussed, and strategies and policies aimed at increasing women's participation in the digital economy will be evaluated. In this context, the digital performance of EU countries is examined, and recommendations will be developed regarding women's contributions to the digital transformation process. In addition to the relation between women's participation in the ICT sector, their internet use in Türkiye has also been investigated. For tech careers, access to the internet serving is a key factor in developing the digital literacy, skills, and opportunities.

The study differs from other work in the field in terms of the methodology, subject and comparison. Defining the correlation between the internet usage and gaining ICT speciality to see the effect on human capital makes the research unique. The sections that emphasize the importance of women's participation in the digital economy and evaluate the impact of the EU's digital transformation are notable. Specifically, the part that highlights the weak and strong relationships between women's internet usage and their employment as ICT specialists which are different according to country groups and the analysis stressing the necessity of education, awareness, and breaking societal prejudices to strengthen this connection, stand out. The findings of the article conclude that correlation between internet usages is meaningful if education, policies on raising awareness and breaking social prejudices prevail in both EU and Türkiye.

Methodology

To determine the role of women in the digital transformation process, which is the focus of the study, DESI data is used. First, the study will assess whether the internet usage rate, one of the most important indicators of digital literacy, is a metric for digital transformation and its role in influencing the qualified human capital that creates added value. For this, a correlation between the internet

usage rate and women working as ICT specialists is examined. Sustainable digital transformation will only be possible with a workforce that has the potential to create innovative value. The impact of basic digital literacy on the development of human capital capable of driving digital transformation is explored. The correlation is measured using the Python programming language, coded in Jupiter Notebook. To ensure a sound evaluation, all EU countries is examined, followed by an analysis of the 13 member states that joined after 2004, which have more heterogeneous economic and social structures. Additionally, a literature review on the status and development of human capital in the digital world is conducted to support the evaluation.

Results

In the EU as a whole, the Pearson correlation coefficient between women's internet usage rates and the percentage of women working as ICT specialists is 0.59. This indicates a positive and statistically significant relationship between the two variables. On the other hand, in the 13 countries that joined after 2004, this coefficient is calculated to be 0.28, indicating a weak relationship. This means that there is not a strong connection between internet usage and the percentage of women in the ICT field in these countries. This means, women's ability to specialize in the ICT field is linked not only to internet usage but also to education and qualified human resources. This situation highlights the influence of socio-economic differences. In addition breaking stereotypes to strengthen women's roles in the digital economy by pursuing studies in STEM (Science, Technology, Engineering, and Mathematics) fields from an early age. The EU aims to increase digital literacy and train highly qualified digital specialists by 2030. Inclusive education policies and strategic approaches to digital skills are emphasized in this context. It is evident that future policies should focus on these elements. DESI data is used to analyse the woman in digital EU. The use of estimated values for certain countries in DESI may not fully capture all aspects of the digital transformation process. Within DESI, "Women in Digital" index is used to measure women's participation in digital transformation that may not fully reflect the social and economic differences between countries. There are significant differences in the levels of digitalization among EU member states. Countries that joined the EU after 2004, in particular, have more heterogeneous social and economic structures compared to other member countries which affect the consistency of the correlation analyses change the findings which let us make implications from a wider perspective.

Discussion and Conclusions

Sustainable digital transformation will only be possible with a workforce that has the potential to create innovative value and women inclusion in human capital. First, DESI data should continue to monitor women's contributions and participation in the digital transformation process, guiding policies to analyse whether gender equality is being achieved in countries' digital transformation processes. There should be concrete steps in areas such as digital literacy, education, labour policies, and cultural change: To increase women's digital skills, greater investment should be made

in STEM fields. In addition, gender equality strategies should be developed to increase female representation at the management level. The EU can introduce mandatory quotas, laws, and regulations to ensure gender equality in member countries.

As a conclusion, the emphasis on how digital skills should not solely rely on internet usage, along with the importance of education, in this process, represents the original insights of the text. The analysis that underlines women's equal participation in the digital economy as a strategic component of the EU's 2030 Digital Compass goals, and the need for increased investments in gender equality-focused education and infrastructure to achieve these targets, is an original assessment of the article. In Türkiye, the participation of women in the ICT sector has been a topic of increasing focus in recent years. Although the country has made some strides toward greater gender equality in various fields, including education and the labour market, women are still underrepresented in the ICT sector, which is a growing and vital part of the Turkish economy. Factors like socio-economic status, geographical location, education, and cultural norms influence both internet use and participation in ICT, highlighting the need for policies and programs that address these barriers to foster greater inclusion of women in the digital economy both in Türkiye and EU-13 similarly.

Keywords: Women in Digital, EU, Türkiye, Digitalisation in Human Capital, Gender

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Exploring the Possibilities of Manufacturing in Programming Education for Women

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Introduction

In recent years, with the advancement of technology, programming skills have become increasingly in demand. In Japan, programming education has been made compulsory in elementary schools since 2020 and in high schools since 2022. However, in university education, a significant number of students are from the pre-curriculum reform era and lack programming experience or have a negative attitude towards it. This is particularly true for students in liberal arts universities, who tend to have a stronger resistance to programming.

Furthermore, for female students like myself, there is a common stereotype that "programming is for men," and many women feel resistant to learning programming due to their perceived lack of mathematical ability.

In this study, based on my own experience as a programming novice, we will concretely demonstrate how female students who are hesitant about programming have changed their attitudes towards programming through creative activities such as embroidery. Additionally, we will discuss the importance of programming education in higher education.

Materials and Teaching Methods

Scratch and Overview of the Classes

In this study, we used Scratch (https://scratch.mit.edu/), a visual programming language. Scratch allows users to program by combining blocks, making it easy for beginners to learn. It is particularly suitable for creating animations and games and is widely used in educational settings. In this study, we analyzed the programming learning process in two types of classes.

> Class A: Information Literacy Basics
>> Purpose: To acquire basic knowledge of programming
>> Content: Pair programming for animation creation. Learn control structures (sequential, branching, repetition), create storyboards, and translate them into programming.
> Class B: Introduction to Computer Science
>> Purpose: To acquire basic knowledge of programming
>> Content: Individual embroidery production. Learn control structures and create embroidery data using Scratch extensions. Actually, embroider using a computer sewing machine.

Class A: Animation Production

In Class A, students worked in pairs to create animations. First, they created storyboards to plan the overall composition and movement of each scene in detail. Then, they used Scratch to program based on the storyboard. Through pair work, they cultivated communication skills, problem-solving abilities, and experienced the fun of programming.

Class B: Embroidery Production

In Class B, students used the Scratch extension (https://scratch.sugiura-lab.jp/) to create embroidery data. This extension allows you to convert shapes created in Scratch into data that can be sewn by a digital embroidery machine. Students created original embroidery works by programming in Scratch based on their own drawings. By combining programming and handicrafts, they stimulated new creativity and increased their motivation to learn.

Practical Examples

Class A: The Very Hungry Caterpillar Animation

Second author created an animation of "The Very Hungry Caterpillar," a picture book I loved as a child, using Scratch. To reproduce the world of the picture book, we used blocks such as "move 5 steps" and "repeat 5 times" to create smooth movements for the caterpillar.

When creating scenes where the caterpillar eats various foods, we created a program for eating one food and registered it as a "block definition." This allowed me to efficiently create scenes where the caterpillar eats the remaining foods, significantly reducing the amount of work.

Working in pairs was a very valuable experience. Thanks to my partner's ideas, we were able to create a more creative animation where the caterpillar changed color depending on the fruit it ate. Also, by discussing with my partner, I was able to improve my communication skills.

We were motivated to take the next step and wanted to challenge myself with more advanced programming.

Embroidery Production

In embroidery production, as with animation production, first author first drew a design of the embroidery we wanted to create and created a detailed design. Based on this design, we created a Scratch program.

The big difference from animation is that since we were actually sewing with an embroidery machine, we needed to simulate the movement of the needle more precisely. For example, depending on the shape you draw, you need to consider the movement of the needle. You need to consider where to insert the needle, where to remove it, and how to move it. You also need to set the stitch type and size in detail.

We challenged ourselves to create a star. As shown in the Figure 1, we created a star by repeating an isosceles triangle six times. We used the "repeat" block to create the program efficiently.
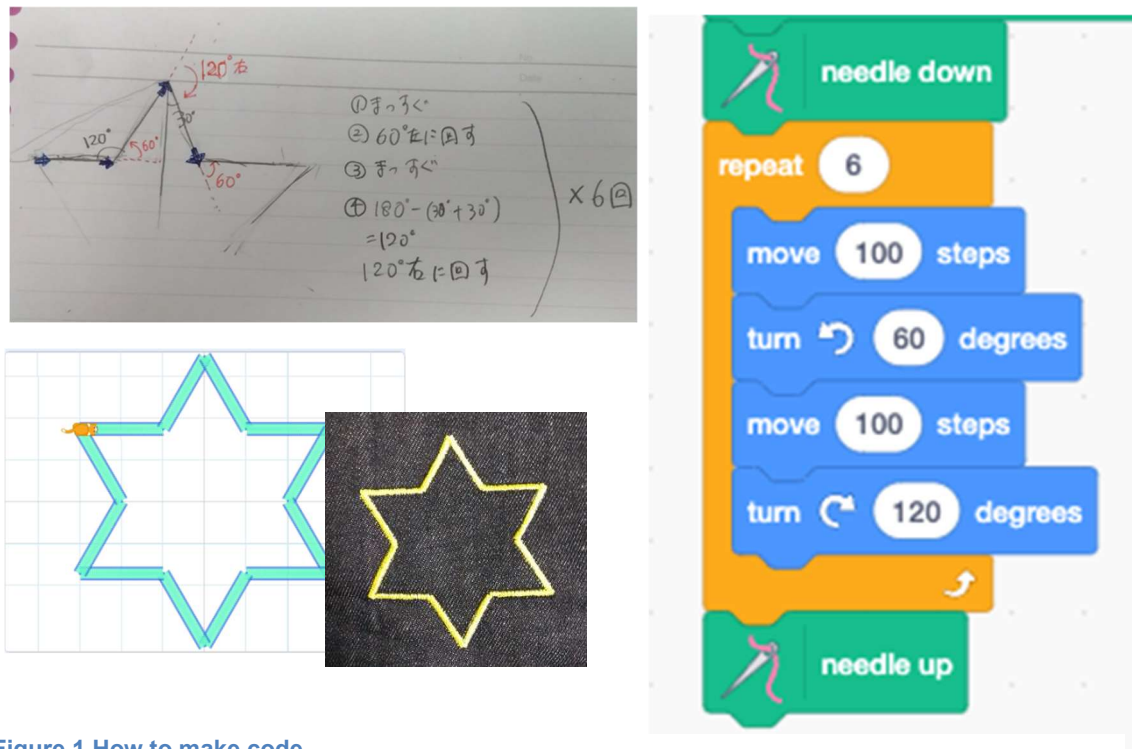

Figure 1 How to make code

Then, we tried to create a hemp leaf pattern by adding multiple straight lines to the star. However, we found that there was a big difference between the display on the screen and the actual embroidery result. In particular, the thread was concentrated in the center, making it look bad and causing problems such as the thread bunching up or the needle breaking. From this experience, we learned that it is very important in programming to compare the simulation on the screen with the actual output and correct the differences.

We were able to easily understand and use the "repeat" control structure. However, we did not fully understand how to use "branching" and in what situations.

Advanced Learning

Although the class was limited in time, we delved deeper into Scratch programming after exhibiting my work at the school festival. Initially, we were only drawing simple shapes, but we gradually became curious about "what would happen if we combined various shapes," and we began to experiment.

In particular, understanding the concept of variables greatly expanded my programming capabilities. By using variables, we could easily modify specific parts of the program, allowing me to experiment efficiently. For example, by defining the size of a triangle as a variable, we could use the same program to draw triangles of various sizes.

We were also able to express complex patterns with a small amount of code by combining repetition and variables. For example, in a program that draws a continuous sequence of triangles, we were able to create a dynamically changing pattern by gradually changing the size of the triangle using a variable.

However, we encountered a new challenge when combining variables and repetition. Specifically, it was difficult to build an appropriate program structure when dynamically changing the value of a variable while performing a repetitive process. To solve this problem, we searched for a way to manipulate variables inside a block definition and eventually found a solution.

Through this production activity, we realized the flexibility and expressive power of programming. In particular, we learned that the combination of variables and repetition is a powerful tool in programming. In the future, we would like to learn more complex algorithms and create more advanced works.

Conclusion

Through programming learning, I realized that programming is not difficult at all, but rather a fun way to cultivate creativity. In particular, I am convinced that visual programming languages like Scratch can significantly lower the barrier to entry for programming beginners.

Combining embroidery, a handicraft that has been popular among women for a long time, with programming was a very valuable experience for me. Embroidery is a craft that requires a sense of beauty and meticulous attention to detail. By combining programming and embroidery, I was able to cultivate both logical thinking and aesthetic sense.

For students who did not have the opportunity to learn programming in high school or who gave up on learning programming once, Scratch is a great starting point to step back into the world of programming. Also, for women who are interested in embroidery, programming may open up new possibilities for them to realize their own designs.

Through this learning, I realized the importance of having a solid understanding of the fundamentals of programming. By having a solid foundation, you can challenge yourself with more complex programs and, if problems arise, you can identify the cause and solve it.

Furthermore, learning programming not only cultivates logical thinking and problem-solving skills but also improves self-esteem. The sense of accomplishment when a program you created works as intended and is actually realized as embroidery is a great joy and further motivates you to learn.

From this experience, I believe that the use of visual programming languages like Scratch in programming education is very effective in increasing students' motivation to learn and overcoming their fear of programming. In particular, by combining elements that women are interested in, such as embroidery, it has the potential to encourage more women to participate in the world of programming.

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Thank you Note by Editor

Thank you very much to all particiapnts of CoSiM 2024

Markus Launer