

Empirical Research on the Application of Generative AI Tools in Group Work Exercises for the Business Producer Course "Circular Economy Product and Service Planning": A Case Study of Learners' Use in Business-Relevant Scenarios

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ABSTRACT

Our Japanese industry-university project group at Aoyama Gakuin University studied new educational programs for “Business Producer Course in a future-oriented business strategy design” for several years. To develop such new human resources, the research members have been engaged in designing new educational methods for group work exercises that combine both “Project-Based Learning” and “Active Learning”. The purpose of this research paper is to demonstrate the effectiveness of lever-

aging generative AI in group work exercises related to "Project 2: SDGs/CE Product and Service Planning," conducted as part of the "Business Producer Course" offered during the second semester of 2024 at the School of Business, Aoyama Gakuin University. The learning outcomes achieved through the use of generative AI tools by learners are analyzed in relation to the three steps that constitute "Project 2".

Key words:

Project-Based Learning (PBL), Active Learning (AL), Group Work Exercise, Business Producer, Product and Service Planning, Sustainable Development Goals (SDGs), Circular Economy (CE)

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1. Introduction

Our Japanese industry-university project group at Aoyama Gakuin University studied new educational programs for “**Business Producer Course** in a future-oriented business strategy design” offered at the School of Business, Aoyama Gakuin University over several years [1]. The research members have engaged in developing new educational methods for group work exercises that combine both “Project-Based Learning (**PBL**)” and “Active Learning (**AL**)”.

As a **PBL** initiative, the decision was made to address business themes aimed at solving future societal challenges, focusing on “Sustainable Development Goals (SDGs)” and the “Circular Economy (CE).” This “**Business Producer Course**” was conducted in the second semester of 2024 at the School of Business, Aoyama Gakuin University.

As part of an **AL** approach, the learners were organized into teams of four to six members. The following outlines the overall design of the group work exercises:

- (1) Initial Program of the Entire Team: “SDGs/CE Business Concept Proposal”
- (2) Project 1: SDG/CE value chain management (VCM) and business model
- (3) Project 2: SDG/CE new product and service planning and sales promotion (the main subject of this research paper)
- (4) Project 3: Smart product and service lifecycle design
- (5) Project 4: Multi-sided sharing platform (MSP) and application software design
- (6) Final Program for the Entire Team, set out in the: “SDGs/CE Business Vision Design Document”

The purpose of last year's research paper in 2024 Aoyama Business Review (ABR) was to focus on research issues by proceeding as outlined below [2]: (1) Addressing the benefits and overcoming drawbacks of modifying the overall class design for group work exercises, (2) Exploring the basic specifications of Digital Books for utilization during group work exercises and their application to the "SDGs/CE Business Concept Proposal" as a case study, and (3) Verification and analysis of the effectiveness of the "SDGs/CE Business Concept Proposal" group work exercise, based on test score results, questionnaire survey analysis, and evaluation of team-specific worksheet outcomes.

The subject of this research paper in 2025 ABR is the above-mentioned "(3) Project 2: SDG/CE new product and service planning and sales promotion." Project 2 follows the three steps outlined below:

STEP 1: Designing "**Personas**" and "**Empathy Maps**" tailored to each stakeholder

STEP 2: Designing the **benefits** or **utilities** of SDG/CE product and service planning

STEP 3: Proposing the appeal of the SDGs/CE product service planning deliverables, and **promoting sales**

The purpose of this research paper is to demonstrate the effectiveness of leveraging generative AI in group work exercises related to "Project 2." The learning outcomes achieved through the use of generative AI tools by learners will be analyzed in relation to the three steps that constitute "Project 2."

2. Types of Generative AI Tools and Platforms

Generative AI, meaning a type of AI technology that can create new content based on data, has been trained on various types of data in the past, such as text, audio, images, or videos. Its applications and use cases are broad and varied, and it can generate a story in the style of a specific author, produce realistic images of non-existent people, compose symphonies in the style of well-known composers, or create a video clip from a simple text description - all in a matter of seconds.

Moreover, generative AI can create new data instances across various formats beyond text. This capability is valuable for designing virtual assistants that mimic human responses, developing video games with adaptive content, and generating synthetic data for training other AI models, especially when real-world data is difficult to collect.

2.1 Types of Generative AI Tools and Platforms

Aditya Sharma [3] explored the top generative AI tools and platforms that were shaping the present and future of technology. He examined how each tool brought a unique set of advantages and numerical advancements to the table.

(1) ChatGPT

ChatGPT, an OpenAI creation, is a dynamic language model known for its remarkable ability to produce lifelike text. With a knack for crafting natural conversations, elucidating queries, and aiding creative writing, ChatGPT showcases exceptional versatility.

This innovation thrives in customer support bots, content creation, and author brainstorming, fostering success across

multiple fields. Its forte in natural language is a boon, continually refined through updates.

Yet challenges arise in its potential for misinformation and bias, coupled with limitations in comprehending intricate contextual nuances.

Key features:

- Generates text that closely resembles human language.
- Engages in conversations that feel natural and authentic.
- Provides detailed and insightful answers to a wide range of queries.
- Offers valuable support and suggestions for creative writing endeavors.
- Demonstrates an ability to understand and respond in contextually relevant ways.

(2) GitHub Copilot

GitHub Copilot revolutionizes coding through collaborative features and integration with popular code editors. It offers code snippets, explanations, and context-based guidance, enhancing developer productivity and learning. It is a versatile tool, enabling faster coding, facilitating learning, and supporting various programming languages. Nonetheless, vigilance is required as some generated code might need polishing, and it heavily depends on external Application Programming Interfaces (APIs) for suggestions.

Key features:

- Seamlessly integrates with popular code editors such as “Visual Studio Code”.
- Generates not only code snippets but also explanations and contextual information to aid developers.

- Provides instant and relevant suggestions for code completion, improving coding efficiency.
- Offers a diverse range of programming language support, accommodating various projects.
- Learns from usage patterns, adapting to individual developer preferences.

(3) GPT-4

GPT-4 represents a leap forward in AI language models, boasting enhanced text generation across various domains. Its prowess shines in content creation, aiding writers, marketers, and educators. Its versatile use in natural language processing tasks enhances data analysis.

Success stories show how it aids in generating innovative narratives and personalized conversational experiences. While it shows improved quality and versatility, vigilance is still essential due to the potential for inaccuracies and biases.

Key features:

- Generates high-quality text across diverse subjects.
- Produces coherent and nuanced responses.
- Empowers users to guide the tone, style, and specifics of generated text.

(4) Claude

Claude is a state-of-the-art AI assistant crafted by Anthropic, representing the result of dedicated research into creating AI systems that are not only helpful but also fair and secure.

Key features:

- Proficiently handles extensive text data processing.
- Engages in natural and fluent conversations.

- Displays multilingual proficiency, spanning common languages and programming languages.
- Streamlines and automates complex workflows.

2.2 Types of Generative AI Suitable for Image Generation

Below are the types of generative AI suitable for image generation and their respective features [4].

(1) Image Creator (Copilot)

An image-generation AI tool was developed by Microsoft. It can create images and illustrations in various styles, including manga, anime, watercolor, cyberpunk, and surrealism.

(2) Stable Diffusion

An image-generation AI released in August 2022 by the UK-based startup Stability AI. This open-source AI uses an algorithm called the "latent diffusion model" to generate images based on user-provided text input. While it is generally available for commercial use, some models may have restrictions on commercial applications, so caution is advised.

(3) Adobe Photoshop

Image editing software provided by Adobe, renowned for its early adoption of AI technology. Currently, it also features generative AI capabilities, allowing users to effectively remove unwanted elements from images and create unique images based on textual prompts.

(4) Canva

Originally image editing software, it is now equipped with a feature to generate images based on textual prompts. Specializing

in image editing, it allows for detailed adjustments such as white balance correction and the addition of effects.

3. Application Methods of Generative AI Tools

3.1 Applications of Generative AI

Here are some of the leading generative AI applications [5]:

(1) Language

Generative AI excels in the domain of text by leveraging large language models. These models are used for a wide range of tasks, including essay writing, code generation, translation, and even analyzing genetic sequences.

(2) Audio

In the realm of audio, generative AI is significant in creating music, developing audio snippets from text inputs, recognizing objects in videos, and generating sounds that correspond to visual content. This technology is also used for speech synthesis and custom music creation.

(3) Visual

Generative AI plays a particularly significant role in image-related tasks. This includes creating 3D images, avatars, videos, graphs, and other illustrations. It can generate images in various artistic styles, edit visuals, design logos, and enhance existing images. For example, it can support drug discovery by visualizing new chemical compounds.

(4) Synthetic Data

Generative AI is a game-changer for synthetic data generation,

especially when real data is incomplete or restricted. By producing synthetic data, generative models can address data gaps, reduce labeling costs, and enhance model training with less labeled data. It supports various modalities and use cases, offering a solution to the data challenges faced by many enterprises.

3.2 Generative AI Workflow

Adhering to the principles of machine learning, the following are the key steps in the generative AI workflow [5]:

(1) Data Collection

It can assemble a large dataset relevant to the type of content to be generated. For instance, it can use a huge dataset of images for generating realistic pictures or a text dataset for producing coherent sentences.

(2) Model Training

The generative AI model can be developed using neural networks. The model is trained using the collected dataset to learn the patterns and structures within the data.

(3) Content Generation

After training, the model can generate new content by sampling from the latent space or utilizing a generator network, depending on the model used. This content reflects what the model understood from the training data.

(4) Refinement

The generated content can be refined or post-processed to enhance the quality or meet specific criteria, depending on the application.

4. Overall Design of Group Work Exercises for the Business Producer Course

4.1 PBL Theme Setting: Group Work Exercises for the Business Producer Course

The SDG target 12.3 “Reduction of food loss” and SDG target 12.5 “Reduction of waste” were integral to the SDG 12 Goal “Responsible consumption and production”. The earlier SDG target 12.3 was “By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses in production and supply chains, including post-harvest losses”.

The later SDG target 12.5 was “By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse”. Furthermore, this target 12.5 was related to the CE. The shift from a linear economy to the CE required new marketing methods. The EU Commission suggested that successful adoption of the CE would require new consumer behaviors [6]. It was necessary to conceive a CE business and consider how to solve CE-specific social business issues.

Each team would find a social issue theme that they hoped to solve from the above-mentioned SDGs and CE perspectives, and decide on their own "SDGs/CE product planning" theme.

4.2 Active Learning with Individual Team Members: Overall Design of Group Work Exercises

The learners were organized into teams of four to six members. This **Business Producer Course** was conducted in the second semester of 2024 at the School of Business, Aoyama Gakuin University. The course consisted of 14 sessions (90 minutes per session, once a week). As the exercises assigned to each team

could not be completed within the class time, they were assigned as homework. The class format was face-to-face, but an online data-sharing learning environment (Google Drive) was set up for group work exercises within each team.

Figure 4.1 illustrates the progression of the course that transitioned to **Course Design** starting from the last academic year 2023. The following outlines the overall design of the group work exercises:

- (1) Initial program of the entire team; **"SDGs/CE Business Concept Proposal"**
- (2) Project 1; SDG/CE value chain management (VCM) and business model
- (3) **Project 2; SDG/CE new product and service planning and sales promotion** (the main subject of this research paper)
- (4) Project 3; Smart product and service lifecycle design
- (5) Project 4; Multi-sided sharing platform (MSP) and application software design
- (6) Final program for the entire team: the final program, which involves compiling the results of all project discussions into a comprehensive **"SDGs/CE Business Vision Design Document"** that reflects the team's findings and proposed solutions.

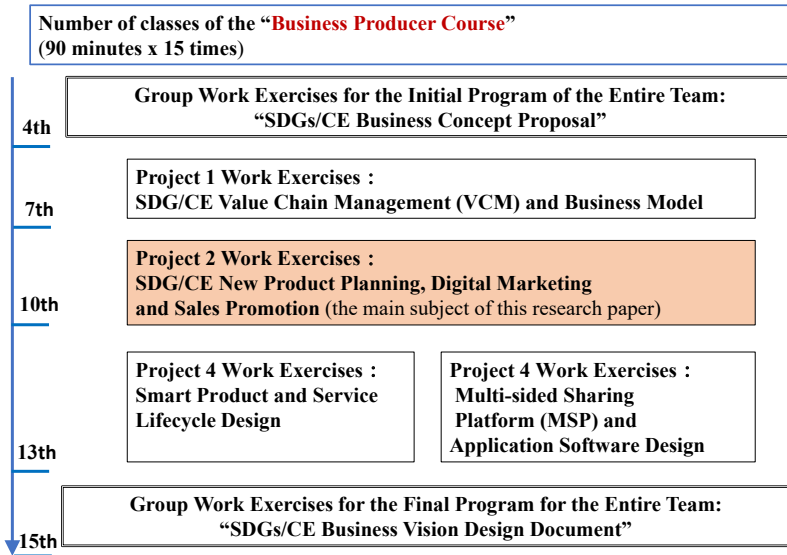


Figure 4.1 Overall Course Design for Group Work Exercises from the 2023 Academic Year [2]

5. Lecture Design for the "SDGs/CE Product and Service Planning"

The prerequisites for Project 2: "Project 2: SDG/CE New Product and Service Planning" are the implementation of (1) the "Initial Program for the Entire Team" and (2) "Project 1: SDG/CE Value Chain Management (VCM) and Business Model," both of which generate the following input information:

(1) Initial Program for the Entire Team; Setting SDG/CE business themes for each team:

- Defining themes for SDG/CE product and service planning
- Establishing themes for the MSP (Multi-side Sharing Platform) that connect multiple stakeholders

(2) Project 1: SDG/CE VCM and Business Model;

- Selecting a specific business model theme from various SDG/CE business models
- Supply Chain Management to implement the selected business model
- Stakeholder management for fulfilling roles within each supply chain

Therefore, "**Project 2: SDG/CE New Product and Service Planning**" is executed based on the two aforementioned prerequisites, following the three steps outlined below:

STEP 1: Designing "**Personas**" and "**Empathy Maps**" tailored to each stakeholder

STEP 2: Designing the **benefits or utilities** of SDG/CE Product and Service Planning

- Identifying the **practical attributes** of the product (function, structure, performance, and quality)
- Defining **TPO** (Time, Place, Occasion) usage scenarios for the product by each stakeholder
- Analyzing **persona empathy** when using the product (physiological, sensory, psychological, and profound meaningful utility)

STEP 3: **Proposing the appeal** of the SDGs/CE product service planning deliverables and **promoting sales**

- Proposing the **attractiveness and image illustrations** to enhance the appeal of the SDG/CE product and service planning deliverables
- **Sales promotion** of the deliverables through marketing initiatives (planning promotional events, creating posters for event displays, and designing handouts for distribution)

[STEP3] represents the new group work exercise content added this year. The group work exercise in **[STEP3]** involved creating materials for sales promotion, including the production of images. Given that most learners had no prior experience with such tasks, it was considered a highly challenging assignment for beginners with no marketing experience.

To overcome these challenges, two key strategies were implemented. Firstly, the instructor during the lectures showcased examples of sales promotion materials they had personally experienced or created, such as promotional poster images, distribution pamphlets, and product packaging designs. These examples helped learners visualize the processes for creating material and enabled them to approach the tasks of creating sales promotion materials with the support of generative AI tools.

Secondly, the lecturer emphasized that creating images using generative AI tools was more complex than requesting standard textual content. The following key points were highlighted:

- Select a generative AI tool specialized for image creation.
- Ensure sufficient pre-learning for the AI: Before requesting an image, provide detailed information to help the AI understand the desired visual concept.
- Iterative prompt refinement: A single prompt is unlikely to yield the desired results. Advise learners to evaluate intermediate outputs, make necessary adjustments, and refine their prompts accordingly.
- Final adjustments by learners: For the final outputs, including posters, distribution pamphlets, and product packaging designs, encourage learners to make manual refinements beyond relying solely on generative AI tools.

The above-mentioned instructions given during the lecture were found to have led to the creation of unique, shared know-how in the excellent team cases described in Chapter 7 below.

6. Worksheets Design for Group Work Exercises of "SDGs/CE Product and Service Planning"

Three types of WS used across the three steps of the lecture entitled "Project 2: SDGs/CE Product and Service Planning" were designed. The design of the WS used in this exercise process and preparation of the exercise environment using a "Digital Whiteboard" are described. Then, the design details of each WS are presented below.

6.1 Three Types of Exercise Worksheets and a Digital Whiteboard for Collaborative Learning

(1) Three Types of Exercise Worksheets

There are three types of WSs [2]. The first type of WS organized contents such as tables, diagrams, and explanations so that each learner could easily describe and express the results of learning with collaborative learning according to the procedure of the individual exercises. It is a WS format for descriptive expression (referred to as a "**White WS**" where nothing is pre-written in the format).

In the second type of WS, instructors and Teaching Assistants (TAs) guided case examples corresponding to the content of their respective exercises in the White WS so that they could visualize how to write the WS ("**Case study introduction WS**").

The third type of WS was a summary of the results of

collaborative learning by each team in response to the assignments of the group work exercise presented by the instructor (referred to as “**Deliverable WS**”).

(2) "Google Drive" for Collaborative Learning on a Digital Whiteboard

The "**Google Drive**," functioning as a digital whiteboard platform, was employed to create an individual "**Deliverable WS**" for team/group collaborative learning in group work exercises. In preparation for the class, each team had its own "working board" within the "Google Drive" platform set up by the lecturer or TA. Subsequently, team members uploaded their respective "**White WS**" into their working board. After renaming the file from "**White WS**" to "**Deliverable WS**," multiple team members collaborated within the same "working board" to complete cooperative learning. Through this collaborative effort, the final submission-ready deliverable for "**Deliverable WS**" was generated.

“**Google Drive**” provides features facilitating collaboration in an online platform environment. "Google Docs" and other applications in the "Google Drive" suite serve as collaborative tools for editing documents in real time. Documents can be shared, opened, and edited by multiple users simultaneously, allowing users to observe character-by-character changes made by collaborators in real time [7].

Changes are automatically saved to Google’s servers, and a revision history is automatically maintained, enabling the review and reversal of past edits. An editor's current position is indicated with an editor-specific color/cursor, allowing other collaborators viewing that part of the document to see edits as they happen.

6.2 Worksheet Design for Group Work Exercises

The following focuses specifically on the “White WS” worksheets where AI is commonly utilized, as detailed later.

(1) WS: STEP 1 Designing "Personas"

- The "**Demographic variables**" include the persona's age, educational background, work history and current occupation, personality, family composition, and characteristics of each family member.
- The "**Psychographic variables**", concerning the “Persona's life scenes”, include Physiological Utility, Sensory Utility, Psychological Utility, and Profound Meaningful Utility.

WS: STEP 1 Designing "Personas"		
Stakeholder:		WS creator name:
Persona name		Persona's photo/illustration
Age, educational background, etc.		
Work history and current occupation		
Personality		
Family structure and individual characteristics		
Lifestyle scenarios of persona	Physiological Utility: Sensory Utility: Psychological Utility: Profound Meaningful Utility:	

(2) WS; STEP 2: Designing the benefits or utilities > “Analyzing persona empathy”

STEP 2: Designing the **benefits or utilities** of SDG/CE Product and Service Planning. This involved:

- **Analyzing persona empathy** from the perspectives of physiological, sensory, psychological, and semantic aspects when using the product.
- **Designing incentives** to encourage stakeholder participation in the project.

STEP 2: Designing the benefits or utilities of SDG/CE Product and Service Planning	
Analyzing persona empathy	
WS creator name:	
Stakeholder	
Role of stakeholder	
Persona empathy/Incentive design for stakeholders to participate in the project	
Physiological Utility :	[Utility] ▪ [Incentive design] ▪
Sensory Utility :	[Utility] ▪ [Incentive design] ▪
Psychological Utility :	[Utility] ▪ [Incentive design] ▪
Profound Meaningful Utility :	[Utility] ▪ [Incentive design] ▪

(3) **WS: STEP 3 Proposing strategies to highlight the appeal of SDGs/CE products and promote sales. This involved:**

- Proposing the **attractiveness and image illustrations** to enhance the appeal of the SDG/CE product and service planning deliverables
- **Sales promotion** of the deliverables through marketing initiatives (planning promotional events, creating posters for event displays, designing handouts for distribution, and logo mark for the product packaging)



Product brand:
“SDGs Annou sweet potato pound cake”
●Anno potato (a Japanese sweet potato variety)

Catchphrase:
A special sweet product created by Aoyama Gakuin students using non-standard sweet potato ingredients

Logo mark for the product packaging:
"Aoyama Students' Food Loss Project"

SDGs
安納芋パウンドケーキ
規格外のさつまいもを使ったスイーツ

販売日程: 12/20 (火)、12/22(木) 10:00~16:00
販売場所: 青山学院大学1号館 購買会(セブンイレブン横)
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青山学院大学玉木ゼミ フードロスチーム
2030年までにフードロスを半減させるという世界目標を達成するため「フードロス新生プロジェクト」を立ち上げました。
皆さんは廃棄フードロスについて考えてもらえるようスイーツ開発などを行っています。
プロジェクトの発展に向けたアンケートへのご協力をお願いします。





7. Overall Evaluation Results of Deliverable Worksheet Materials Submitted by Learners' Teams

A total of 67 second- to fourth-year business students registered for the “Business Producer Course” at Aoyama Gakuin University's School of Business in the second semester of 2024. For the group work exercise, teams were formed with four to six members from these registered students.

Table 7.1 shows the results of the grading of the Project 2 deliverables WS submitted by the teams. Among the registered students, approximately 60 actively participated in the group work exercise for Project 2, resulting in the formation of 11 teams (Teams A to K). Teams that utilized generative AI tools are marked in the table.

Table 7.1 Results of grading of the Project 2 deliverables WS submitted by the teams (showing the teams that used generative AI out of the 11 teams)

11 Teams	A	B	C	D	E	F	G	H	I	J	K	Average V.	Standard D.
STEP1(10)	8	6	4	8	8	4	2	4	8	8	8	6.18	2.27
STEP2(10)	8	6	2	10	2	4	4	6	8	6	6	5.64	2.51
STEP3(10)	8	10	2	8	6	4	4	8	8	6	6	6.36	2.34
Total (30)	24	22	8	26	17	12	10	18	24	20	20	18.27	6.01

In Project 2, the maximum score across its three steps (10 points per step) was 30 points. Setting a passing standard at 60% resulted in an average score of 18.27 with a standard deviation of 6.01. Excluding two teams with low scores, the results for the remaining teams demonstrated generally satisfactory performance.

It should be noted that these scores are provisional, reflecting assessments conducted mid-course (Project 2 spanned the 7th to

10th sessions within the 14-session term). Instructors and TAs reviewed the deliverables submitted by each team, comparing them against instructions provided during lectures and group work exercises. Teams received feedback on areas needing improvement, with opportunities to revise and resubmit their deliverables.

In the "(6) Final Program for the Entire Team; "SDGs/CE Business Vision Design Document"" shown in **Figure 4.1** above, the intermediate WS of Project 2 could be used as a reference for improvement feedback and was submitted by each team as a final WS. As a result, it is expected that the performance of all teams will improve further.

Analysis of Scoring and Generative AI Utilization Across the Three Steps of Project 2:

- (1) STEP 1: Designing "Personas" and "Empathy Maps" Tailored to Each Stakeholder
 - This step required teams to create a deliverables WS for each stakeholder included in the "team-specific VCM" established in Project 1.
 - Although the average score was not low among the three steps, the standard deviation showed some variability. Inferring from these results, it is thought that the difference in the success or failure of the collaborative learning process was due to whether the roles were well divided within each team or whether the aforementioned Google Drive sharing function was utilized.
 - Regarding generative AI utilization, many teams employed AI to create "persona photographs" by pre-training the tool on

demographic variables. Additionally, some teams used AI to gather diverse insights into “psychographic variables”, such as life scenarios, enriching their persona WS with deeper internal observations.

- (2) STEP 2: Designing the Benefits or Utilities of SDGs/CE Product and Service Planning
 - STEP 2 was an exercise in which product and service planning was carried out in three stages, and it was the STEP with the heaviest learning load as it was the core of the product planning in Project 2.
 - Consequently, its average score was the lowest among the three steps.
 - Regarding how to utilize generative AI, some teams used the multifaceted answers from the generative AI for the last workshop of the three stages, "Analyzing persona empathy (physiological, sensory, psychological, and semantic aspects) when using the product.
- (3) STEP 3: Proposing the Appeal of the SDGs/CE Product Service Planning Deliverables and Promoting Sales
 - As mentioned above, this exercise was expected to be difficult because it involved creating images related to sales promotion— a challenging task for learners.
 - However, the highest average score was observed for this step. A significant contributing factor was the effective use of generative AI, with nearly all AI-utilizing teams incorporating AI-generated images into their deliverables.
 - These new findings were that many teams made collaborative use of generative AI to create images (among the five teams

that used generative AI mentioned above, almost all used generative AI to create their images).

8. Case Study: Analysis of Learner Use of Generative AI Tools During Exercises

In the group work exercises of STEP 1, STEP 2, and STEP 3, seven out of 11 teams utilized generative AI at some points. The instructors deliberately refrained from providing specific instructions on how to use generative AI during the exercises. Instead, the decision regarding in which part of the exercise process to integrate generative AI was left to the discretion of the learners. When generative AI was used, the following rules were established:

- Insert blank slides after the deliverable WS where generative AI was specifically applied for the exercise task.
- Clearly specify which type of generative AI tool was selected for the exercise task,
- Describe the "prompt" crafted for the selected generative AI tool,
- Present the "response document" or "illustration/photo" obtained from the selected generative AI tool, with underlined sections deemed to hold particular reference value,
- Similarly, submit the deliverable WS re-created during the exercise process, with underlined sections influenced by the underlined reference points in the generative AI tool's output.

8.1 STEP 1: Case Study of Utilizing Generative AI for "Persona" and "Empathy Map"

(1) **Case of Team D:** Using Generative AI for "Persona": Final Consumer's Personality and Lifestyle

1) Generative AI Tool Used: **ChatGPT**

2) **Prompt Description (1)**

Preliminary Learning: Persona (Final Consumer) "Personality"

Persona Name: Ayaka Sato

Age: 32

- **Background:** Works at an advertising agency in Tokyo as a project manager. She has been in the advertising industry for 10 years since graduating from university. Recently, she has been involved in projects related to sustainability and has become more interested in environmental issues.
- **Final Consumer of the Upcycled Product Line for the "Bettumbrella Brand** (A hypothetical product brand created by Team D): a business that creates new products such as bags from discarded plastic umbrellas”.

Prompt Objective: Please consider the personality of the above individual.

3) **Response Text from the Generative AI Tool (1)** (with underlined sections that were deemed to hold particular reference value)

- Positive and Curious: Always interested in new trends and enjoys collecting information. She is particularly sensitive to topics related to sustainability and ecology, constantly seeking ways to incorporate them into her lifestyle.
- Balanced Mindset: Values a balance between work and family, striving to dedicate herself fully to both. Enjoys spending time with her family and raising children while also taking

her career as a project manager seriously and aiming to work efficiently.

- Strong Sense of Responsibility: Demonstrates a professional attitude, making every effort to meet client expectations. In the sustainability field, she considers the societal and future impacts of her actions and makes responsible choices.
- Sociable and Values Connections: Emphasizes teamwork and enjoys exchanging ideas with colleagues and friends to grow. Frequently connects with like-minded individuals on social media, gaining inspiration and sharing her interests.
- Rational and Practical: Strives to eliminate waste in her busy daily life, carefully comparing options before making purchases. She is particularly attracted to sustainable products that are well designed and practical.

(2) Prompt Description (2): Preliminary Learning and "Lifestyle Scenes" of the persona (Final Consumer)

1) Generative AI Tool Used: **ChatGPT**

2) Prompt Description (2)

Preliminary Learning: Study the previously described "personality" of the persona (Persona Name: Ayaka Sato) in "Prompt Description (1)"

Prompt Objective: Please consider the "lifestyle scenes" of this individual, including their hobbies, preferences, lifestyle, and values.

3) Response Text from the Generative AI Tool (2)

- Hobbies/Preferences:

Activities that are enjoyable with children, such as crafting handmade toys and attending "Do It Yourself" workshops,
Exploring family-friendly cafes and restaurants,

Collecting Instagram-worthy household items and eco-friendly products,

Using environmentally-friendly products, such as organic foods and eco-goods.

Enjoying seasonal events like Halloween and Christmas by decorating and taking photographs,

Engaging in arts and crafts activities with children on weekends, incorporating original creations into home décor.

- Lifestyle:

Family-centered life, spending weekends at parks or shopping malls with children,

Busy daily routine utilizing time-saving recipes and practical household items,

Sharing children's growth milestones on Instagram and interacting with other parents,

Practicing eco-friendly activities on a local level, such as recycling and participating in flea markets,

Planning short excursions or camping trips with family on weekends to consciously allocate time to connect with nature,

Prioritizing children's education and emotional development by investing in educational toys and books.

- Values:

A strong belief in "protecting the environment for the future of children",

A preference for simple and practical items, with an appreciation for products that have a compelling story,

Prioritizing family bonds while also valuing self-expression,

Emphasizing connections with the community by actively participating in local events and workshops,

Cherishing family memories by capturing and preserving special

moments through photos and albums.

(3) Case of Team D Using Generative AI for "Empathy Map":
Preliminary Learning and Empathy Map of the Persona (Final Consumer)

- 1) Generative AI Tool Used: **ChatGPT**
- 2) **Prompt Description:** Preliminary Learning and Instructions for Empathy Map Categories

Preliminary Learning: Study the persona (Final Consumer) described in above Team D in advance.

Prompt Objective: To align with the preliminary learning of the previously described persona, please generate content based on the following categories included in the "Empathy Map": Says, Does, Thinks, Feels, Hears, Sees, Pains, and Gains.

3) Response Text from the Generative AI Tool:

- Says:
I want a product like this.
I wonder if it can be made with this kind of material?
This product is eco-friendly and beautifully designed.
- Does:
Use the app to register and donate discarded umbrellas.
Shares the purchased product on social media, promoting eco-conscious activities.
- Thinks:
Could this be an opportunity to reuse other waste materials?
What kind of upcycled products will be created next?
- Feels:
A sense of reassurance from contributing to environmental conservation.
A feeling of unity as personal belongings become part of

society.

Satisfaction from obtaining a high-quality product.

- Hears:

Success stories of how the materials they provided were reused innovatively.

Experiences and reviews from other users.

- Sees:

Tracking features within the app showing the process from collection to product creation.

Visuals of design proposals and completed products.

- Pains:

Space taken up by unused umbrellas and the hassle of disposal.

Dependence on mass-produced products.

- Gains:

Satisfaction from owning environmentally-friendly products.

Unique and original bag designs.

Feeling of participating in a sustainable society.

8.2STEP2: Case Study of Utilizing Generative AI for "SDGs/CE Product and Service Planning"

- (1) Case Study of Team B: Leveraging Generative AI for "(1) Identifying the practical attributes of the product" and "(3) Analyzing persona empathy"**

1) Generative AI Tool Used: **ChatGPT**

2) **Prompt Description:** Preliminary Learning and Questions for **"(1) Identifying the Practical attributes"**

Preliminary Learning:

- The generative AI tool was pre-trained on the business model of an Italian restaurant that collaborates with farmers, agricultural cooperatives, and primary food processors to

utilize surplus seasonal ingredients.

- The restaurant develops SDGs/CE-aligned Italian menu options, prepares, and serves them.
- In addition, the persona (Misaki Sato) assumed to be the target customer of this Italian restaurant was also pre-learned.

Prompt Objective:

What kinds of social issues do you think this Italian restaurant can help solve for its target customers?

3) Response from the Generative AI Tool:

- This SDGs-compliant restaurant contributes to solving social issues for its target audience, such as the persona (Ms. Misaki Sato), by providing food choices that emphasize health, environmental responsibility, and social accountability.
- Specifically, through initiatives such as reducing food waste, selecting sustainable ingredients, offering healthy menu options, and engaging in social contribution activities, the restaurant raises consumer awareness and promotes societal transformation. These efforts resonate deeply with the values of individuals like Ms. Sato, making it an attractive choice for such consumers and enabling broadier societal impact.

2) Prompt Description: "(3) Analyzing persona empathy"

Prompt Objective:

Please explain the physiological utility of the processors collaborating with the SDGs-oriented Italian restaurant.

3) Response from the Generative AI Tool

The physiological utility (physical and psychological satisfaction and convenience) derived by processors collaborating with the SDGs-oriented Italian restaurant is directly linked to sustainable food processing and supply processes. The following

are examples of specific utilities:

- Healthy and Safe Working Environments:

Reduction of Hazardous Substances: By using sustainable processing techniques and raw materials, and minimizing the emission of harmful substances, the physical health of primary food processors is protected.

Improved Working Conditions: The introduction of energy-efficient equipment and waste-reducing technologies creates a clean and safe working environment, reducing physical burdens on workers. *(Further details omitted for brevity)*

(2) Case Study of Team H: Leveraging Generative AI for "(3) Analyzing persona empathy"

1) Generative AI Tool Used: **ChatGPT**

2) **Prompt Description:**

Prompt Objective:

Please list thoughts related to the intangible and physiological utility (physiological, sensory, psychological, and meaningful) of a female employee working for a company developing a matchmaking application that connects farmers who have surplus vegetables to environmentally-conscious consumers. Additionally, propose incentive designs to encourage positive engagement for each type of utility.

3) Response Text from the Generative AI Tool

- **Physiological Utility:**

Stress can be caused by searching for farmers to register on the application and increasing customer numbers.

To mitigate stress, establish achievable performance goals and provide rewards upon achievement.

- Sensory Utility:

Considering how surplus food affects the environment.

To avoid overthinking or overreacting, offer opportunities to learn accurate knowledge within the company.

- Psychological Utility:

Enjoying the sense of contributing positively to the environment through work.

To address potential declines in motivation when contributions are not properly recognized, implement a system for evaluating individual contributions and encourage active communication among employees.

- Profound Meaningful Utility:

Feeling proud and satisfied with engaging in socially meaningful work.

Ensure recognition of the societal contributions of contributors' work and regularly review individual job goals and performance targets to prevent excessive feelings of obligation.

8.3 STEP3: Case Study of Utilizing Generative AI for “Attraction Proposals and Sales Promotion of Planned Deliverables”

The following are examples of exceptional team cases where generative AI was effectively utilized for image creation in several ways. These cases reveal a set of shared best practices that can be considered new findings:

- Selecting appropriate generative AI tools for image generation,
- Providing sufficient information during the preliminary learning phase to ensure effective image creation,
- Crafting instructions (prompts) accordingly after understanding

the desired image concept on the part of the learner,

- Evaluating images proposed by the generative AI tools after each iteration,
- Continuously refining the prompts until the target image is achieved as the final deliverable.

To respect the learners' copyright, the iterative prompts will be described; however, the final generated images will not be included in this research paper.

(1) Case Study of Team D: Utilizing Generative AI for the Creation of "**Concept Product Image**" to Propose the Appeal of Their Deliverables:

- 1) Generative AI Tool Used: **ChatGPT**
- 2) Description of prompt: Preliminary Learning and Questions concerning "Concept Product Images"

Preliminary Learning: Pre-learning of **Team D** had been completed on the persona and empathy map from STEP 1 mentioned above.

- After collecting used "plastic umbrellas", recycle the plastic material and manufacture and sell "upcycled bags".

Prompt Objective:

Instruction 1: The product name of the upcycled bag is "**Bettumbrella**." Please create a product image with the logo of this product name. Additionally, make the image feature a woman holding the bag, showcasing its usage scene. The woman should represent the consumer persona—a happy mother with her child, keeping in mind the consumer persona.

→Evaluating images proposed by the generative AI tools after each iteration.

Instruction 2: Without changing the other elements of the image, please make the bag more stylish and sophisticated. It is

not necessary to include a recycling mark in the design but ensure that the logo for "Bettumbrella" is stylishly incorporated. Since it is an upcycled product made from vinyl umbrellas, the bag should be made of plastic.

→Evaluating images proposed by the generative AI tools after each iteration.

Instruction 3: Design the bag with a transparent, iridescent finish that reflects light in rainbow colors. Also, make the logo more stylish. The design should only include the logo without any other embellishments. The rest of the image should remain unchanged.

→Continuously refining the prompts until the target image is achieved as the final deliverable.

3) Image Creation by Generative AI Tool:

The generative AI tool created images of the "upcycled bag (with logo)" based on the given prompts.

(2) Case Study of Team I: Utilizing Generative AI for the Creation of an "Illustrated Image" to Propose the Appeal of their Deliverables:

1) Generative AI Tool Used: **Microsoft Designer**

2) Description of prompt:

Prompt Objective:

Please provide an illustration of a robot that eliminates food waste by processing and recycling it within households.

Please depict the recycling process, where the collected waste is turned into fertilizer, which farmers use to produce new vegetables.

Please illustrate a happy world where food is not wasted, showcasing an environmentally-conscious society.

3) **Illustrated Image** Created by the Generative AI Tool:

The generative AI tool designed an illustration representing a robot facilitating food waste elimination, recycling into fertilizers, and promoting sustainable agricultural practices in a harmonious, eco-friendly world.

(3) Case Study of Team G: Utilizing Generative AI for the Creation of a Promotional Poster Featuring a "**Catchphrase**" and "**Poster Image**" for a Sales Promotion Event:

1) Generative AI Tool Used: **ChatGPT**

2) **Prompt description (1):** Preliminary Learning and "**Catchphrase**" Creation

Preliminary Learning:

The SDGs/CE product and service plan theme involves a brainwave device development company. They developed a "**wearable brainwave-reading chip**" that can infer menu choices based on the customer's mental image during a restaurant visit and automatically send the order to the in-house system.

Prompt Objective:

Please request a promotional catchphrase for the poster.

3) **Generated Catchphrase** from the generative AI tool:

The input query was, "Output a catchphrase that highlights the service's ability to enhance ordering efficiency while reducing food waste in a way that appeals to users."

The initial idea was "No hesitation! Your perfect dish".

2) **Prompt description (2): "Creating a poster image"**

The initial output request was for a "futuristic, wearable-looking bangle," but the result had a bulky black design.

The prompt was then modified to refine the image: "Based on

the initial design, create a smaller, simpler version in white."

The process was repeated two or three times with slight adjustments before finalizing the design.

3) **"Creating a poster image"** from the Generative AI Tool:

The finalized catchphrase and a minimalist poster design showcasing the futuristic white wearable bangle were generated. This imagery aligned with the advanced, eco-conscious theme of the project.

(4) Case Study of Team J: Utilizing Generative AI for "Poster Image Creation" at a Sales Promotion Event

1) Generative AI Tool Used: **Canva** Text to Image

2) **Prompt description:** Preliminary Learning and **"Poster Image Creation"**

Preliminary Learning: Concept of a poster design for display

Focus on the keywords:

"New Agriculture",

"Local Production for Local Consumption" and "SDGs."

Communicate the appeal of futuristic and sustainable agriculture in a simple way.

Highlight tools that enable easy access to smart agriculture and knowledge-sharing as part of a new agricultural model,

Appeal to young people and beginners in agriculture by emphasizing "Agricultural Know-How Videos" and the simplicity of the app.

Promote the "convenience of local production for local consumption" to general consumers seeking fresh local produce.

Target environmentally conscious audiences by emphasizing the contribution to SDGs.

Prompt Objective:

Poster Image Creation: "Poster on Application SDGs in Agriculture"

3) **Poster Image Outcome** from the Generative AI Tool:

A poster image was generated that reflected the core themes of sustainable agriculture and SDGs, showcasing a visually appealing representation of an app promoting local produce and smart agriculture. The design featured clean, modern elements aimed at engaging younger and environmentally-conscious audiences.

9. Conclusion

The purpose of this research paper was to demonstrate the effectiveness of leveraging generative AI in group work exercises related to "Project 2: SDGs/CE Product and Service Planning," conducted as part of the specialized course "Business Producer Course" offered during the second semester of 2024 at the School of Business, Aoyama Gakuin University. The learning outcomes achieved through the use of generative AI tools by learners were analyzed in relation to the three steps that constituted "Project 2: SDGs/CE Product and Service Planning."

STEP 1: Exercises on "Personas and Empathy Maps"

In exercises related to persona design worksheets (WS), a notable trend was observed: many learners used generative AI tools to gather diverse perspectives, particularly when delving into the "psychographic variables" (hobbies/preferences, lifestyle, values) that explored the personas' "life scenes," rather than merely determining "demographic variables" related to persona characteristics.

Additionally, during exercises requiring a persona design for each stakeholder, cases were frequently observed where generative AI tools were employed to propose "photo images" of personas after conducting the pre-learning on personas. It was particularly noteworthy that in comparison to last year's deliverable worksheet (WS), the "photo images" presented using generative AI tools accurately captured the characteristics of each stakeholder in line with each team's business content.

STEP 2: Exercises on "SDGs/CE Product and Service Planning" (three stages: practical attributes, TPO usage scenarios, and persona empathy)

In this step, some learners used generative AI tools in the final stage, "persona empathy," to explore "physiological, sensory, psychological, and meaning" aspects. For learners who had already used generative AI tools during persona design in STEP 1, their preliminary preparations for this stage were notably smooth.

It was also noteworthy that during lectures, learners were guided to critically evaluate AI-generated suggestions rather than blindly accepting all of the opinions. They were encouraged to underline the insights they found useful and incorporate them into their WSs. This approach contributed to the effective use of generative AI tools and enhanced learning outcomes.

STEP 3: Exercises on "Proposing the Appeal of SDGs/CE Product and Service Planning Deliverables and Promoting Sales"

In STEP 3, where creating promotional images for sales was required, the exercises proved challenging for students with no prior marketing experience. However,

nearly all teams utilizing generative AI successfully overcame this difficulty by creatively employing the tools.

During lectures, it was emphasized that generating images with AI is more complex than creating text-based content and requires specific strategies. In the case of the excellent team responsible for the [STEP 3] deliverables WS, a new discovery was that they were able to acquire the "common know-how" to effectively use generative AI in the process of actually creating images, by taking account of the aforementioned creative points based on lecture instructions.

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