

A Study on Video-Based Service Prototyping through the Use of Generative AI

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Abstract

This study examines the potential and production process of video-based service prototyping using generative AI and analyzes its practical significance through an industrial complex policy hackathon case. The research combines a literature review on generative AI, service prototyping, and video-based prototypes with a case study. The service concept proposed at the 2026 Industrial Complex Policy Hackathon, which integrates the Galaxy Road, Safe Stop, and Smart Pole, was translated into a generative AI-based scenario, storyboard, key visuals, and video prototype. The findings demonstrate that generative AI contributes to enhancing efficiency and experimentation in the early planning stage by transforming abstract service ideas into visual and narrative outputs within a short period of time. However, the study notes that AI-generated outputs require further examination in terms of consistency between scenes, copyright, ethical issues, and practical feasibility. Ultimately, this study suggests that generative AI can significantly expand the scope of video-based prototyping methodologies within the service design process.

Keyword : Generative AI, Service Design, Video-Based Prototyping, AI Production, Service Concept

1. Introduction

Recently, generative AI has rapidly expanded as a technology that automatically generates or assists in producing various forms of content, including text, images, audio, and video [1]. Large language models can generate planning documents, scenarios, explanatory texts, and user personas based on natural language input, while text-to-image and video generation models are increasingly used to transform ideas into visual scenes and dynamic video sequences [2]. As a result, generative AI is being actively adopted in design, content production, and service planning to concretize ideas, produce visual materials, and simulate user experiences in advance [3].

In traditional service planning, documents, diagrams, personas, user journey maps, and storyboards have mainly been used to explain service ideas. However, these methods have limitations in intuitively conveying the spatial context, temporal flow, user behavior, and emotional experience of how a service actually operates. Unlike products, services are intangible and process-oriented; therefore, expressing

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service experiences requires a form of representation that includes context and sequence rather than relying solely on static artifacts [4].

In service design, prototyping is a core process for validating ideas and building consensus among stakeholders. A prototype is not merely a preliminary version of a final output; rather, it functions as an experimental medium for exploring ideas, anticipating usage situations, and enabling stakeholders to discuss the value and limitations of a service [5]. In particular, in fields involving multiple stakeholders, such as public services, urban environmental improvement, industrial complex policy, and local problem-solving, it is important to visualize service ideas through concrete scenes and narratives.

In this context, video-based prototypes have strong communicative power because they can integrate usage situations, user behavior, emotional changes, spatial environments, and system operations. Video can represent user movement, gaze, actions, and interactions over time, while also communicating changes before and after service implementation through visual narratives [6]. Therefore, video-based service prototypes can improve the comprehensibility and persuasiveness of service proposals and strengthen stakeholder communication in policy proposals or design presentations.

However, conventional video prototyping requires considerable time, cost, and professional expertise in planning, shooting, editing, and graphic production. In this situation, generative AI enables non-experts to create scenarios, images, storyboards, and video scenes within a relatively short period of time. This makes it possible to quickly visualize early-stage service ideas, iteratively explore alternatives, and use video prototypes as effective communication tools in time-constrained environments such as hackathons and policy workshops.

Therefore, this study examines the potential of video-based service prototyping using generative AI and analyzes how service ideas are concretized into video prototypes through an actual policy hackathon case. Through this, the study discusses how generative AI can be used not merely as a content production tool but as a methodological tool that supports ideation, visualization, user experience communication, and stakeholder persuasion in the service design process.

The research method combines literature review and case study. First, studies on generative AI, service prototyping, and video-based prototypes are reviewed. Next, the process of producing video prototypes based on generative AI is organized. Finally, this study analyzes the production process and significance of a generative AI-based video prototype through the case of "Connecting Light: Turning the Night of Industrial Complexes into Opportunity," which was planned during an industrial complex policy hackathon in April 2026.

2. Theoretical Background

2.1 Generative AI and Changes in the Production Environment

The emergence of generative AI has brought significant changes to content production. Previously, outputs were generally created by professionals with specialized software and production skills. In a generative AI environment, however, planners and designers can generate and modify outputs through natural language prompts. This lowers the entry barrier to production and enables rapid idea testing and iterative experimentation [7].

Generative AI also has strong applicability in service design. Service design involves problem definition, user research, ideation, prototyping, and validation, and generative AI can support the expansion of thinking and concretization of expression at each stage [8]. For example, it can generate personas based on user problems, write service usage scenarios, or visualize scenes in which a service operates in a specific space through images or videos. These characteristics are especially useful in hackathons, workshops, policy design, and educational settings where ideas must be proposed within a limited time.

2.2 Concept and Role of Service Prototyping

Service prototyping is an activity that simulates and examines the process and experience of a service before it is actually provided. While product prototypes are primarily based on physical form and function, service prototypes are structured around user behavior, interaction, touchpoints, temporal flow, and emotional experience [9]. Therefore, service prototypes function as tools for explaining ideas, media for facilitating stakeholder communication, and experimental devices for user validation.

Service prototyping can be divided into low-fidelity and high-fidelity prototypes. Low-fidelity prototypes include sketches, scenarios, role-playing, and paper models and are suitable for quickly reviewing early-stage ideas. High-fidelity prototypes, on the other hand, include screens, spaces, interactions, and videos that resemble the actual service and are effective in communicating user experience more realistically [10]. From this perspective, video-based service prototypes can be understood as a type of high-fidelity prototype.

Video-based service prototypes can simultaneously show the space and time in which a service operates, user behavior and emotions, and the operation of technological systems. In the case of public

policy or urban problem-solving services, it is especially important to persuasively communicate the environment in which the service will be applied and its expected social effects. In service design practice, prototypes play the role of engaging stakeholders and transforming abstract ideas into discussable forms.

2.3 Characteristics of Video-Based Service Prototyping

Video-based prototyping is a method of implementing service ideas in video format to communicate user experience visually and narratively. Its significance lies not merely in showing an output, but in constructing a flow that explains what problem the service starts from, how it operates, and how it changes the user experience.

The first characteristic of video-based prototypes is contextual communication. Since services operate within specific environments and situations, it is important to show the user's location, time, movement path, surrounding environment, and social conditions together. Video can represent these contexts scene by scene, thereby intuitively conveying the necessity and effects of a service.

The second characteristic is the expression of emotional experience. Service design addresses not only functional problem-solving but also emotional factors such as anxiety, expectation, satisfaction, and trust. Video can express emotional changes before and after service use through lighting, color, movement, human behavior, and narration. Therefore, video-based prototypes are effective in persuasively communicating the emotional aspects of user experience.

The third characteristic is the efficiency of stakeholder communication. Various stakeholders, including policy makers, corporate actors, citizens, and users, can more easily understand the value of a service through concrete scenes and stories than through technical terminology. Therefore, video-based prototypes can serve as effective persuasive tools in service proposals, policy presentations, investment pitches, education, and public communication [11].

3. Generative AI-Based Video Prototype Process

3.1 Service Idea Definition and Scenario Development

The first step in producing a generative AI-based video prototype is to clearly define the service idea. At this stage, the problem to be solved, target users, service context, and core value are established. Since design problems require not only solving given problems but also reframing and reinterpreting

them, the service idea definition stage must identify the problem situation in a concrete and structured manner.

Next, user scenarios are developed. A user scenario organizes a representative situation in which the service operates in narrative form. Generative AI can be used at this stage to quickly generate user personas, usage contexts, changes before and after service use, and major touchpoints based on the problem situation. However, AI-generated scenarios should not replace actual user research and contextual analysis; rather, they should be used as supporting materials for concretizing early-stage ideas.

3.2 Prompt Design and Video Prototype Production

In generative AI-based prototyping, prompts are key elements that determine the direction and quality of outputs. A prompt can be understood not as a simple command but as a design sentence that includes the service idea, spatial setting, user behavior, emotional atmosphere, visual style, camera composition, and purpose of the scene. In image and video generation, the more specifically the purpose of the scene, characters, spatial background, lighting, color tone, movement, and camera motion are described, the more likely it is that the output will reflect the service intention clearly.

Prompt design can be divided into text prompts, image prompts, and video prompts. Text prompts are used to generate service scenarios and narration. Image prompts are used to create visual concepts for key scenes. Video prompts are used to add movement, transitions, camera work, and temporal atmosphere to generated images. An important factor in video-based service prototypes is consistency between scenes. Since generative AI often produces outputs independently for each scene, a prompt system is needed to maintain the same service concept and visual atmosphere.

A video prototype should not merely generate aesthetically pleasing images but should explain the structure of the service. Therefore, the scenes should be organized in the sequence of problem presentation, service proposal, operation mechanism, and expected effects.

In the video prototype production stage, images or video scenes are generated based on the previously developed scenarios and storyboards, and then edited into a coherent flow. Production methods can largely be divided into text-to-image, image-to-video, and text-to-video methods. The text-to-image method is suitable for visualizing key service scenes as static images, while the image-to-video method is effective in adding camera movement, human motion, changes in light, and spatial depth to static scenes.

4. Case Study

4.1 Case Overview

The case examined in this study is the project titled "Connecting Light: Turning the Night of Industrial Complexes into Opportunity," proposed during an industrial complex policy hackathon hosted by the Ministry of Trade, Industry and Energy in April 2026. This case reinterprets the nighttime safety problem of industrial complexes from the perspective of service design and visualizes the policy idea using generative AI. The project begins with the idea that the nighttime environment of an industrial complex should not be viewed merely as a dangerous space, but as a potential basis for local vitality through the connection of light, mobility, and technology.

4.2 Production Process of Generative AI-Based Video Prototyping

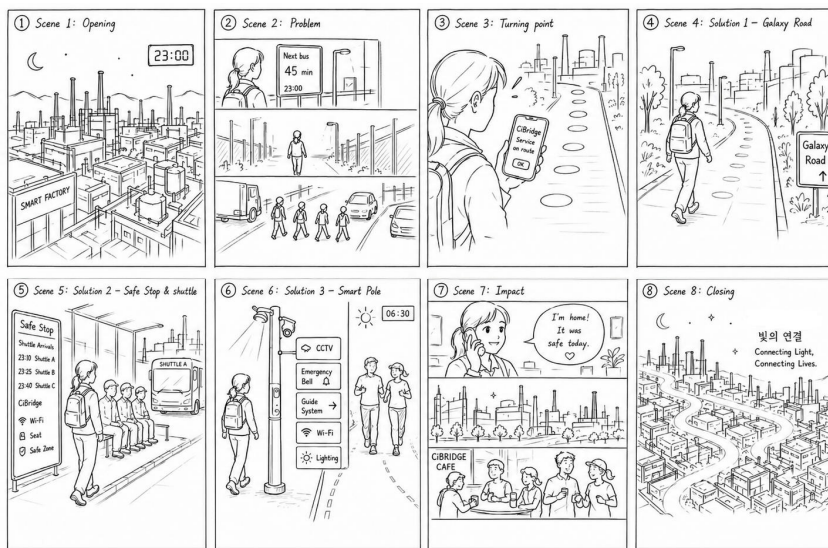
The generative AI-based video prototyping in this case was conducted by visually diagnosing the nighttime safety issues of industrial complexes and transforming service ideas for addressing them into a scene-based video structure. The process proceeds in the following order: scenario development based on the service concept, storyboard design for each scene, and image and video production using generative AI.

[Table 1] Scenario Development of "Connecting Light: Turning the Night of Industrial Complexes into Opportunity"

Scene	Title	Visuals
1	Opening The industrial night	Drone shot descends over a dark industrial complex at night. Factory clock reads 23:00. A closing siren sounds.
2	Problem Ji-eun's commute	Ji-eun exits the factory into a dark alley. Bus stop reads: Next bus: 45 min. Split screen - workers waiting alone, a dark path, a dangerous mixed-traffic crosswalk.
3	Turning point The change begins	Ji-eun's phone lights up: "CiBridge service now open." She looks up - the alley floor begins to glow softly, illuminating the path ahead.
4	Solution 1 Galaxy Road	Ji-eun walks a glowing path. Floor lights activate with each step. Trees shimmer softly on both sides - like walking under stars.
5	Solution 2 Safe Stop & shuttle	A bright, covered bus shelter. A digital board shows real-time shuttle arrivals. Ji-eun waits comfortably with coworkers.
6	Solution 3 Smart Pole	A Smart Pole brightens automatically as Ji-eun passes. Camera, emergency bell, and guidance system are built into one pole. Morning: two workers jog along the running course.
7	Impact The ripple of change	Three cross-cut scenes: Ji-eun calls home with a smile. A bright, clean industrial exterior. A community café - joggers and coffee drinkers side by side.
8	Closing Light connects	Drone shot returns. The Galaxy Road's light flows like a river across the entire complex, brightening the whole frame. Logo appears.

[Table 1] presents the results of organizing the service concept into a scenario in collaboration with Claude AI. The scenario visually distinguishes the key problems of the industrial complex at night, including the dark and disconnected nighttime environment, insufficient nighttime public transportation, poorly lit pedestrian spaces, and mixed movement routes. It also proposes an integrated solution combining the Galaxy Road, Safe Stop, and Smart Pole, and presents the expected effects of securing safe nighttime commuting, improving the image of the industrial complex, and restoring local vitality.



[Fig. 1] shows the scene-by-scene storyboard images generated by ChatGPT based on the scenario.



[Fig. 1] Storyboard Image

[Table 2] Examples of Prompts and Key Visual Images

Prompt	Key Visual Images
Photorealistic aerial drone shot descending toward a massive nighttime industrial complex in South Korea. Dense cluster of smokestacks emitting faint steam under a dark sky, heavy machinery silhouettes, dim amber warning lights blinking on tower structures. Camera angle transitions from wide aerial to ground level revealing a narrow dark alley with cracked pavement, zero streetlights, deep shadows cast by towering factory walls...	
A cinematic realistic, full-body shot of a Korean female protagonist named Ji-eun in her late 20s. She is walking out of a heavy industrial factory door into a dark, narrow alleyway at night. She has a tired but resilient expression, holding a yellow industrial hard hat in one hand, having just taken it off. Her hair is slightly messy from work...	

<p>Ji-eun, a Korean female factory worker in her late 20s, walks along a glowing path at night in a South Korean industrial complex. Floor lights embedded in the pavement activate one by one with each step. Small trees shimmer softly on both sides, creating the feeling of walking under stars...</p>	
<p>A photorealistic cinematic night scene in a South Korean industrial complex. Ji-eun, a Korean female factory worker in her late 20s, waits comfortably with coworkers inside a bright, covered bus shelter. The shelter has warm lighting, glass panels, benches, and a digital board showing real-time late-night shuttle arrivals...</p>	

[Table 2] presents the key visual images and prompts generated using ChatGPT for the production of a generative AI-based service prototype video. [Fig. 2] shows the main keyframes of a video clip generated by Grok AI Imagine, with the key visual image attached.



[Fig. 2] Keyframe Images of the Video Prototyping

5. Conclusion

This study analyzed the concept, production process, and case application of video-based service prototyping using generative AI. The findings confirm that generative AI can support the entire process from idea generation and scenario development to storyboard production, key visual creation, and video prototype production. In particular, generative AI contributes to enhancing experimentation and efficiency in the early planning stage by transforming abstract service ideas into visual and narrative outputs within a short period of time.

However, generative AI-based video prototyping also has limitations. Images and videos generated by

AI may lack consistency across scenes in terms of characters, spaces, lighting, and textual expressions. In addition, issues such as copyright, data bias, ethical responsibility, and practical feasibility must be carefully examined. Therefore, outputs generated by AI should be used not as final service implementation plans, but as intermediate outcomes for early-stage idea exploration and stakeholder communication.

In conclusion, generative AI is a useful tool for rapidly shaping service ideas and transforming them into video-based prototypes. In particular, generative AI-based video prototyping has high applicability in fields where the context, experience, and expected effects of a service need to be communicated visually. Nevertheless, AI-generated outputs can function as practical tools for service innovation only when combined with feasibility verification, ethical review, and user evaluation.

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