EXPLORING THE PERSUASIVE DESIGN ELEMENTS OF INSTAGRAM: A FRAMEWORK-BASED EVALUATION OF USER ENGAGEMENT AND BEHAVIOUR INFLUENCE THROUGH PERSUASIVE SYSTEM DESIGN (PSD)

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Abstract:

Existing literature has established that social media can be highly persuasive on a broader scale, yet comprehensive evaluation of persuasive strategies on Instagram remains scarce despite its widespread usage. Instagram, a globally popular social networking platform, lacks thorough academic examination regarding its persuasive technological strategies despite its significant impact on user behaviour and interaction patterns is already realised. The platform's emphasis on visual content, interactive features, and evolving engagement tools presents a unique landscape for studying persuasive strategies. This study aims to fill this gap by assessing the integration of persuasive technological strategies within Instagram, focusing on behaviour change and user motivation. Employing the 'Persuasive Systems Design (PSD)' framework, widely recognized for developing and evaluating persuasive systems, this study dissects persuasive elements in Instagram. The evaluation reveals an effective utilization of persuasive techniques to engage and captivate users on Instagram. This evaluation not only contributes academically but also holds implications for industrial practices, offering insights into how persuasive designs influence user behaviour on a highly influential social media platform.

Keywords:

Instagram*,* Persuasive systems, Persuasive System Design (PSD), Persuasive Technology, Social Media

Introduction

The use of technology to influence people's behaviour and attitudes without coercion is known as "Persuasive Technology (PT)" (Fogg, 2009; Wiafe & Nakata, 2012; Filippou et al., 2016; Orji et al., 2018). PT has been applied across various fields to design systems aimed at behaviour change in humans. Numerous research studies have explored the use of PT, and extensive research continues to apply PT across various domains. These objectives are achieved through the application of persuasive techniques or principles. Persuasive techniques are strategies employed in the design of persuasive systems to bring about desired behavioural changes. PT has found successful application in domains such as education (Orji et al., 2018), healthcare (Orji & Moffatt, 2016), e-commerce (Adaji & Vassileva, 2018), and social media (Fogg & Iizawa, 2008).

On the other hand, social media platforms are commonly used for socialising with family and friends, engaging in romantic pursuits, interacting with brands, job seeking, professional networking, and conducting business (Aichner et al., 2021). Online social networks represent social structures where individuals with similar interests, needs, and goals interact, communicate, collaborate, and share knowledge. Currently, Facebook is considered the largest online social network globally (Biggest social media platforms 2023 | Statista, 2023). Fogg and Iizawa (2008) argued that for an online social network to succeed, it must motivate its users to adopt specific behaviours, such as connecting with other users on the platform and sharing content.

Despite having various social media networks, Instagram has become one of the most widely used social networking networks among the younger generation (Golbeck, 2015; Mutabazi,2023). In academic literature, a thorough evaluation of the persuasive strategies used on Instagram is rather rare, despite the widespread use realised and evidenced in various domains. Instagram continues to be an area that needs more research and examination because of its considerable impact on user behaviour, interaction patterns, and the deployment of persuasive technological strategies. With its emphasis on visuals, interactive elements, and ongoing changes to its engagement tools and content formats, Instagram presents a distinctive setting for evaluating the implementation of persuasive strategies on the platform.

Literature Review

The intersection of PT and social media platforms has become an area of exploration for understanding how these platforms influence and shape user behaviour. While PT, rooted in altering behaviours and attitudes through interactive computing products, has been studied extensively, its application within social media platforms remains relatively uncharted territory. This section aims to discover the realm of PT in Social Media, navigate through its application in social media, and the growing need to evaluate its persuasive effects using frameworks such as Persuasive System Design (PSD).

Persuasive Technology (PT)

PT has been applied and studied through computer applications and tools (Fogg, 2003). The theory of 'Captology' focuses on designing, researching, and analysing interactive computing products created to alter people's behaviours and attitudes (Fogg, 2003). Considering computers as PT is strongly associated with the term 'Captology'. The term defines changes in behaviour or attitudes resulting from human interaction with computers (Fogg, 2003). Specifically, captology explores how people are persuaded and motivated when interacting

with computing products. Consequently, a PT tool is described as an interactive product intended to change behaviours or attitudes, or both, by making the desired results easier to achieve.

Persuasive Technology in Social Media.

The influence of social media is rapidly expanding worldwide. Social media is commonly referred to as social networking and a marketing tool. Indeed, social media is a type of computer application that can serve as a tool to simplify and enhance daily activities. It offers an interactive experience by influencing, motivating, and persuading individuals in various ways. A study by Hassan et al. (2015) sought to measure the extent to which social media can function as a PT system in business and found that it can be an effective and persuasive tool for businesses.

In today's world, different social media platforms have implemented various PTs to attract users over other competing social media networks. There is substantial existing research on PT in social media, similar to the research conducted on applying PT in other applications (Fogg & Iizawa, 2008; Ruas et al., 2014; Waardenburg et al., 2012; Wiafe & Nakata, 2012). PT represents an emerging form of behaviour change agent that has gained popularity with the emergence of social media. Many businesses and brands have shifted their marketing practices to social media platforms (Aichner et al., 2021). For example, a study by Kamalruzzaman et al. (2021) indicated that, in 2020, nearly 81% of Malaysians were active social media users, contributing to behavioural changes through the usage of online social networks. Established firms and brands now recognise that social networking platforms have become a central aspect of consumers' behaviour and lifestyle (Hassan et al., 2015). Although social media has recently emerged, its popularity and versatile uses have risen significantly (Hassan et al., 2015). Therefore, studying how PT is implemented on social media becomes essential. Thus, exploring Instagram through the Persuasive Systems Design (PSD) becomes more intriguing.

Instagram as a Persuasive System

This section explores the Instagram application through the lens of PSD principles as described by Oinas-Kukkonen and Harjumaa (2009). Instagram functions as a photo and video-sharing application, allowing users to capture and digitally alter images before sharing them on Instagram and various other social media platforms such as Facebook, Twitter, and Tumblr. Instagram can be classified as a social photography application designed for social media users to engage with others through visual and text-based content in the form of photos and videos (Marketing with Instagram, 2017). Thus, considering both the theory of captology (Fogg, 2003) and the functional triad (Fogg, 1998), Instagram can be examined as a tool, a medium, and a social actor in shaping target behaviours or attitudes.

The primary objective of this study is to identify the PT principles implemented on Instagram. Subsequent sections will present the analysis findings in line with the research questions, initially offering an overview of Instagram through the PSD model and ultimately highlighting the PT elements employed within Instagram.

Existing Persuasive Design and Evaluation Frameworks

Persuasive design is a practice that focuses on directly or indirectly influencing a user through product and service attributes to encourage the user to take specific actions. Several persuasive models have been developed to guide designers in creating systems that go beyond usability to

become persuasive. One such model is the Fogg Behaviour Model (FBM), which identifies user behaviour based on three factors: triggers, ability, and motivation. The desired behaviour is achieved when these three factors occur simultaneously. FBM aims to influence behaviours rather than attitudes and is a straightforward approach to behaviour change, yet it lacks validation (Fogg, 2009). An extended version of the Fogg Behaviour Model named "The Persuasive Systems Design (PSD)" framework was developed by Oinas-Kukkonen and Harjumaa (2009). PSD is a comprehensive model for designing and evaluating persuasive systems. Consequently, this study has chosen PSD to evaluate Instagram.

Persuasive System Design (PSD) Framework
The PSD framework primarily provides a way to conceptualise technology-mediated persuasion and evaluate persuasive elements within a persuasive system. PSD outlines the sequence of processes for designing and evaluating a persuasive system. Additionally, it details the type of content and functionality present in the final output (Oinas-Kukkonen & Harjumaa, 2009). PSD emphasizes seven core postulates for any system to qualify as a persuasive system. Furthermore, PSD defines twenty-eight design principles categorised under four domains to guide the design and evaluation of a persuasive system.

According to Oinas-Kukkonen and Harjumaa (2009), the development of a persuasive system should follow a three-step process. The first step involves understanding the fundamentals of persuasive systems, followed by analysing the context of the persuasive system. The final step entails the actual development of the system with the chosen features.

Understand the fundamental issues behind the persuasive systems
In this phase, the PSD model describes seven underlying postulates that should be referenced first in the design or evaluation of any persuasive system. These postulates affirm *that i. Technology may not always remain neutral ii. Users of the system prefer views about the world to be consistent and organised. iii. Persuasion can be executed through direct or indirect strategies. iv. The persuasion process is incremental. v. Persuasion through a persuasive system is an open process. vi. Persuasive systems should have minimal restrictions. vii. Persuasive systems should be user-friendly and beneficial.* A system can be assessed and validated as a persuasive system only if it aligns with all seven postulates.

Analysing the Persuasion Context as per the PSD Framework
The PSD framework emphasizes the analysis of the persuasion process to ensure the system possesses adequate persuasive attributes. The analysis process should encompass the usage context, understanding the roles of the persuader and persuadee, the communicated message, the communication channel, and the message context. Moreover, persuasive systems should analyse the user context, considering the user's needs, interests, motivation, ability, persistence to change, and personality. These aspects are depicted in Figure 1 within the persuasion context column.

Design of system features
The third phase of the PSD framework elucidates 28 design principles crucial for consideration when designing and evaluating a persuasive system. These principles are categorised into four groups based on the targeted behaviour to achieve and the tasks required to accomplish the intended behaviour. The principles and their respective categories are illustrated in Figure 1 under persuasive design features.

PERSUASION CONTEXT	PERSUASIVE DESIGN FEATURES			
	PRIMARY TASK SUPPORT	DIALOGUE SUPPORT	CREDIBILITY SUPPORT	SOCIAL SUPPORT
The Intent	Reduction	Praise	Trustworthiness	Social learning
Persuader	Tunneling	Rewards	Expertise	Social comparison
Change type	Tailoring	Reminders	Surface credibility	Normative influence
The Event	Personalization	Suggestion	Real world feel	Social facilitation
Use context[a]	Self-monitoring	Similarity	Authority	Cooperation
User context[b]	Simulation	Liking	Third party endorsements	Competition
Technology context[c]	Rehearsal	Social role	Verifiability	Recognition
The Strategy				
Message				
Route				
[a] Problem domain dependent features [b] User dependent features e.g. goals, motivation, lifestyles, and others [c] Technology dependent features				

Figure 1: PSD Model.

Source: Oinas-kukkonen and Harjumaa (2009).

Previous Studies Used PSD Framework to Evaluate Persuasive Systems
The evaluation of e-commerce websites employing the PSD framework reveals insights into the persuasive features implemented in online shopping platforms. Loh and Hamid (2021) evaluated Lazada and Shopee, demonstrating that both platforms integrated 71.43% of PSD principles. Primary task support was the most emphasized, followed by dialogue support. The study underscores the influence of persuasive features on the success of e-commerce websites, indicating potential manipulations to enhance other platforms. Al-mutairi and Alshamari (2020) conducted a similar evaluation in Saudi Arabia, emphasizing the significance of persuasive designs in converting users into customers. Their study identified the adoption of primary task support, credibility support, and dialogue support while highlighting shortcomings in social support principles. It suggests the need for better implementation strategies in e-commerce applications.

In another study, Alhammad and Gulliver (2014) explored persuasive features in ten successful e-commerce websites using the PSD framework. They found extensive use of persuasive features related to dialogue support, credibility support, and primary task support. The study provides suggestions to enhance persuasive feature implementation through contextual examples. Adaji and Vassileva (2016) evaluated Amazon's success by assessing both personalization methods and the integration of PSD principles. They identified the implementation of all PSD principles in Amazon, emphasizing its potential as a guide for e-commerce platforms to enhance or build their systems. Similarly, Adaji and Vassileva (2016) used the PSD framework to evaluate Netflix's persuasiveness, discovering the implementation of PSD principles within the platform.

Similarly, Nkwo and Orji (2018) conducted an expert evaluation of Jumia, an African e-commerce site, utilizing the PSD framework. They found Jumia employing persuasive techniques to attract and retain customers. These studies collectively underscore the importance of evaluating persuasive features in various persuasive systems and highlight areas for improvement, emphasizing the efficacy of the PSD framework in evaluating persuasive systems.

Objective of the Study

Due to the scarcity of literature evaluating the presence of persuasive technologies in social media, this research aims to assess Instagram, a rapidly expanding and esteemed social media platform, through the lens of the PSD framework. Specifically, this study seeks to identify the PT techniques implemented on Instagram. Hence, the research question addressed in this study is as follows:

"What PT techniques fall under the primary task, dialogue, system credibility, and social supports, as found in Instagram?"

Methodology

The persuasive elements were examined by the authors from 2021 to 2023 while using the author's personal Instagram actively which falls under qualitative methodology. In the context of evaluating elements in Instagram for their persuasive aspects, the qualitative approach involves closely examining and documenting specific features, interactions, or content within the platform to gain insights. This process included analysing posts, interactions, interface design, user engagement tools and other elements within Instagram to identify patterns, themes, or characteristics that could contribute to persuasion. The qualitative methodology involved subjective interpretation, aiming to understand the subjective experiences as a user and perceptions of users and the persuasive aspects of Instagram elements, rather than systematically performing a qualitative analysis.

For the validation and evaluation of PT elements identified in Instagram, expert reviews were conducted. These reviews involved three individual experts: one Instagram influencer and two Information and Communication Technology (ICT) specialists with specialized knowledge in persuasive system design. The selection of experts was based on the relevant expertise to provide comprehensive insights into the persuasive features of Instagram. The Instagram influencer was chosen due to the experience and understanding of user engagement, content creation, and the appeal to its user base. On the other hand, the ICT specialists were selected for their proficiency in persuasive design and their capability to critically evaluate the PT elements present in Instagram. The experts' reviews were sought through a structured walk-through (O'Regan, 2019). A structured walk-through is a type of peer review in which the author of a deliverable such as a project document brings one or more expert reviewers to receive feedback on the quality of the deliverable (O'Regan, 2019). Since this peer review is a guided review it was suitable for obtaining an expert's opinion on evaluation. These evaluations aimed to garner expert opinions and insights regarding the effectiveness, functionality, and impact of persuasive elements employed in Instagram.

Evaluation of Instagram through PSD Framework

This study utilized the PSD model described by Oinas-Kukkonen and Harjumaa (2009) to address the research question: to identify the persuasive techniques employed in Instagram. Preceding this, a valid justification was established through the first and second phases of the PSD framework to perceive Instagram as a persuasive system. Subsequently, the focus of the third phase of the PSD framework was directed towards identifying PT principles.

Phase One: Understand the Fundamental Issues Behind the Persuasive Systems

As outlined in in phase one of the PSD framework, encompassing the seven postulates necessary for any persuasive system, this section presents an evaluation of the Instagram application based on the PSD postulates. A comprehensive examination of the Instagram

application unequivocally indicates that Instagram satisfies the seven postulates. Hence, Instagram can be deemed as a persuasive system (Table 1).

Table 1: Postulates Of PSD Framework Through Instagram

Postulates of PSD	Postulates from the perspective of Instagram
Information technology is never neutral.	Persuading a user of Instagram often needs a sequence of processes and often needs updates of techno features to meet the user's goal. It is obvious to see the Instagram API introduces new features and facilities overtime to persuade users to use the API or to get a specific behaviour change from using the Instagram API
People like their views about the world to be organised and consistent.	Instagram support creating commitments; so that the users are more likely to be persuaded.
Direct and indirect routes are key persuasion strategies.	Instagram implies the personal background and situation of the user to have a substantial influence on getting persuaded.
Persuasion is often incremental.	Posting a series of content on Instagram through incremental suggestions impacts persuasion more than the one-time consolidated suggestion. It can be seen that the users of Instagram, especially Instagram influencers, often share sequential content on the Instagram wall and stories to influence their followers by employing persuasion.
Persuasion through persuasive systems should always be open.	Content creators on Instagram can either be influencers or ordinary users, often removing the creator bias with the content.
Persuasive systems should aim at unobtrusiveness.	Contents in Instagram avoid disturbing users while the users are using other features in Instagram by fulfilling the positive expectations of the viewers.
Persuasive systems should aim at being both useful and easy to use	Instagram is very easy to use, very easy to create and post content

Phase Two: Analysing the Persuasion Context as per the PSD Framework
Besides justifying a system through phase one, a persuasive system requires additional justification from the perspective of the persuasion context. Table 2 illustrates the interpretation of phase two components in PSD concepts concerning Instagram.

Table 2: The Conceptualisation of PSD from The Perspective

Persuasion Context		Definition from the perspective of Instagram
The Intent	Persuader	Instagram, Influencers
	Change Type	Any negative behaviour through the content shared on Instagram or persuasiveness to use Instagram over other social media apps
The Event	Use Context	Attraction towards positive behaviour
	User Context	Motivation to use Instagram

	Technology Context	Persuasive elements in available on Instagram to be used in content such as filters, AR elements, reels, and more
The Strategy	Message	Content of the Instagram post
	Route	Direct: Instagram Posts (Contents)
		Indirect: The interactivity of posted content.

Phase Three: Design of System Features

The analysis conducted at this stage aimed to identify the PT features utilized within Instagram. The third phase of the PSD model termed the "design of system features," is divided into four categories: primary task, dialogue support, system credibility, and social support. The subsequent subsections provide a detailed elaboration of the findings.

Category of Primary Task Support

PT principles within this category ensure simplicity for users to execute the most crucial tasks. The following sections depict the PT techniques within Instagram API's primary task support category aimed at attracting users.

Reduction. Instagram simplifies user tasks for achieving target behaviours by employing reduction strategies. For instance, new users easily create profiles by simply clicking "Login with Facebook" instead of filling out a sign-up form. They can also find followers from their contacts or Facebook lists, with recommended accounts based on contacts. Additionally, tapping the screen's bottom enables users to search for people to follow. The "Discover People" link aids users in finding others to follow, leveraging mobile contacts for discovery. Instagram's feature allowing multiple account additions and seamless switching without logging out enhances user convenience. In messaging, users can send various content types via "Instagram Direct" to multiple recipients, including photos, posts, and hashtags. Stories are automatically saved in "Stories Archive" but can be disabled in settings. The camera facilitates sharing content in Feeds, Stories, Reels, or Live. Instagram's QR code feature streamlines following specific accounts, enhancing accessibility. Efficient content reporting via the adjacent "Report" link further simplifies user interactions. These reduction strategies optimize Instagram's user-friendliness for diverse computing skill levels.

Tunnelling. The principle suggests that leading users through sequential processes while persuading them holds persuasive power. Tunnelling, prevalent on Instagram, intertwines with other PT techniques like suggestion and tailoring. Instagram utilizes "automatic suggestion" for preferred content, guiding users across various interfaces based on followed profiles and recent searches. The "Shop" feature is conveniently accessible across multiple sections like feed, explore stories, reels, Live, and IGTV, eliminating the need for specific page navigation. Moreover, a shop-cart button leads users to product websites, while the tag feature grants instant access to tagged profiles. Instagram content provides step-by-step purchasing instructions and referrals to external company websites. Users can make purchases from the following shops, discover new ones in Instagram Shop, and save items to the "Wishlist." They can also link external websites in profiles or highlight specific products in the bio ("link in bio") to attract more users. For Instagram shopping-approved accounts, direct product tagging for promotion is available. Adding a contact button (email or phone) on profiles facilitates easier user contact.

Tailoring. The principle of tailoring suggests that a system becomes more persuasive when tailored to a user's potential needs, interests, personality, usage context, or other relevant factors related to a user group. Instagram offers a flexible interface to personalize content according to users' needs, targeting various unique user groups. This approach enables each user to optimize Instagram's functionalities to target behaviour change. Instagram presents diverse functionalities for creating content that caters to the preferences of the target user groups. The platform provides step-by-step instructions for acquiring products or services and refers users to the originating company's website.

Personalisation. The principle of personalization asserts that systems gain persuasive power by offering personalised content or services. Instagram uses user data, including browsing history, to predict preferences and behaviours, and customizing future content recommendations. This personalisation relies on cookies, enabling users to follow personalised content. Users can personalise account settings on Instagram for content and security. For example, they can selectively hide stories from unwanted viewers. Additionally, the platform provides varied options for creating video content in multiple resolutions and aspect ratios, with specific technical requirements. Branded content ads are also available, allowing collaboration between creators and business partners for promotions. Instagram offers a wide array of filters, augmented reality tools, stickers, effects, and music options to personalize story or reel content. To refine personalised advertising for adults, Instagram provides advertisers with enhanced targeting options based on specific demographics or user interactions. This targeting includes user interests, visited websites, and sponsored content interactions. As advertisers gain more targeting options, older audiences will have additional settings to manage their personalized ad experiences on Instagram

Self-Monitoring. The principle of self-monitoring denotes that a system supporting users in tracking their performance significantly aids users in achieving targeted goals. Instagram provides users with the ability to track performance and reach through the "Insights" option. Despite stories being ephemeral, users have the option to save stories in the "Story Highlights" section. Additionally, content reach analysis is available in the "Actions" section, displaying likes and comments on posted content. Upon boosting created content on Instagram, users can assess its performance using insights. Businesses can utilize multiple insights to gain a deeper understanding of their content and ads' performance. These insights offer an overview of accounts reached, engaged accounts, total followers, and potential earnings (if applicable). Instagram's insights feature allows users to understand their audience, including post viewership statistics such as age range, gender, and location. Users can also create their own hashtags and explore the hashtags used by competitors.

Simulation. The principle of simulation suggests that a system's persuasiveness is heightened when users perceive the link between cause and effect. Interpreting the implication of the simulation principle on Instagram is complex and subject to varied arguments. However, it aligns with the creation and sharing of content on the platform. For example, a cosmetic brand may post or share stories illustrating the effects of their products with and without their cosmetics, aiming to simulate persuasion among users. Similarly, a gym brand might showcase before-and-after pictures to simulate user persuasion towards using their brand. While the simulation strategy does not directly imply technical features, Instagram does offer functionalities that can contribute to this principle. For instance, brands can promote upcoming Live video sessions through posts or stories to generate interest in advance. During the live

broadcast, users can engage using the Q&A feature or provide shoutouts to commenters, boosting engagement and potentially persuading users to purchase badges.

Rehearsal. The principle of rehearsal posits that allowing users to practice the target behaviour within a system could enhance its persuasiveness in changing people's behaviour. Instagram facilitates user guidance through help options, providing new users with the opportunity to practice using Instagram features before actual utilization. Additionally, users have the option to preview a short segment of a video rather than buffering the entire length. For those interested in viewing the entire video, Instagram provides an IGTV option. Moreover, Instagram's "Reels" feature enables users to record and edit short videos for up to 60 seconds using the Instagram camera.

Category of Dialog support

The PT principles in this category enhance the system's persuasiveness by providing feedback to users. Within Instagram, human-computer interaction occurs through likes, comments, shares, questions, and answers facilitated by interactive stickers, enabling interaction between content creators and viewers. The subsequent sections depict the notable PT techniques discovered on Instagram associated with dialogue support.

Praise & Rewards. The principles of praise and rewards intersect on Instagram through various user actions. Users can praise content by liking, sharing, or commenting on posts. Instagram offers multiple avenues for content creators to earn rewards. Sponsored posts or stories enable monetization through collaborations with sponsors. Promoting businesses in content generates advertising income, encouraging professional account development. Users also earn money by receiving badges during Live videos from the audience, with viewers purchasing badges as tips to support showcased talents or products. Monetization extends to video content, allowing users to earn through ads placed within videos based on views. The revenue share typically constitutes 55% of generated ad revenue per view, paid monthly. Additionally, rewards are also attainable through giveaways on Instagram.

Reminder. The reminder principle suggests that if a system reminds users of their target behaviours, users are more likely to achieve their goals compared to systems that do not. Instagram implements this principle by automatically notifying users through notification options to remind them to check specific events on their profiles. Instagram sends notifications for various reasons, such as when someone follows, likes, or comments on photos or videos, mentions the profile in a comment, sends a message, or when any followed user goes live. Additionally, Instagram allows users to set daily reminders using the "activity" option.

Suggestion. The principle of suggestion, a significant PT technique on Instagram alongside reduction and tunnelling, emphasizes the persuasive impact of offering appropriate suggestions. When users type names into the search box, Instagram provides account suggestions. The "Search and Explore" feature also recommends photos and videos from unfamiliar accounts based on user interests. Additionally, product suggestions are based on user purchase trends.

Instagram offers content and profile suggestions across various categories, providing a flexible interface for feed and story creation. The platform's 2016 update eliminated chronological content ordering, introducing an algorithm prioritizing popular content. Automatic content suggestions are personalized based on followed profiles and search history, leveraging cookies

for enhanced recommendations. Verified badges hold persuasive power, but for unverified accounts, Instagram suggests alternative means of authentication—linking to an official website, Facebook Page, YouTube, or Twitter account. The platform employs sensitivity control algorithms, enabling users to set preferences for content restrictions according to comfort levels.

Similarity. This principle suggests that people are more easily persuaded by systems that remind them, in meaningful ways, of others who behave similarly. Instagram offers equal opportunities and features to all users for content creation. However, it was not immediately evident to see significant functionality aligned with this principle. Yet, observations indicate that certain music and content were restricted to specific countries only. This observation may suggest that Instagram offers special music limited to particular geographical locations

Liking. This principle posits that a visually appealing system is more likely to be persuasive, indicating that a system should possess a compelling visual design that appeals to its users. Assessing the appeal of Instagram to users would require a dedicated user study. Wirtz et al. (2013) highlight that user interactions positively impact the perceived attractiveness of social media. Moreover, attitudes towards social networking sites also influence their perceived attractiveness. Notably, Instagram boasts a substantial user base, as indicated by Statista Research Department (2021), ranking fourth in terms of user numbers, following Facebook, YouTube, and WhatsApp. This substantial user base could serve as an indicator of its appeal.

Social Role. The principle suggests that the PSD model should adopt a social role to encourage users to use it persuasively. Instagram fosters community engagement while prioritizing security. Users can initiate live broadcasts to interact with followers in real time and share replay access from the Live Archive afterwards. The platform enables the creation of "nonprofit fundraisers" for thirty days, promoted across posts, stories, or live videos through a "donation sticker." To ensure relevant and appropriate ads, Instagram mandates compliance with Community Guidelines and Advertising Policies. Specifically for young users, targeted ad options are limited based on age, gender, and location, adhering to stricter ad policies. Instagram uses interactive stickers for COVID-19 awareness and vaccination promotion. The sensitive content control option aligns with the principle of a social role.

Category of System Credibility Support

The PT principles in this category delineate the methods to design a system that is more credible to users, thereby enhancing its persuasive power. Instagram notably demonstrates persuasive system credibility support features on its site. The following sections elucidate the PT techniques employed in Instagram associated with system credibility support. This paper further expounds on how system credibility features were implemented to enhance positive user experiences on the Instagram platform.

Trustworthiness. The principle of trustworthiness emphasizes credibility in a system to persuade users effectively. Instagram establishes itself as trustworthy through detailed operational guidelines covering user privacy, payment processes, and information security. The platform provides a secure API for personal information sharing and offers verified badges for brand credibility. Instagram prevents direct downloading of content to safeguard against potential copyright violations. Users can report harassment, block individuals, and enable "two-factor authentication" for added account security. Account settings allow users to choose

between public and private visibility, regulating content access for approved followers. These features significantly enhance Instagram's system credibility and user trust.

Expertise. This PT principle states that the system should provide information showcasing knowledge, experience, and competence. Instagram regularly updates users with information regarding its platform changes and advancements. Additionally, Instagram has introduced "Instagram Lite," designed to consume less data and function efficiently across all networks.

Surface Credibility. The principle emphasizes people's initial assessment of a system's credibility upon usage. Instagram's credibility is enhanced by its visually appealing design and user-friendly interface, especially for novice users. Notably, its credibility is fortified through several features: Unlike Facebook, Instagram limits advertisements, ensuring a smoother user experience on both web and mobile versions. Users have control over their interactions, utilizing options like "Restrict" to approve comments before display and managing messages from restricted individuals in a separate inbox. Users can manage interactions on business accounts by blocking specific individuals, controlling post tagging and mentions, pinning positive comments, and filtering out inappropriate comments through settings like "Tags and Mention Settings" and "Comment Filter." Manual filtering of words, phrases, numbers, and emojis is also possible. Additionally, default reported keywords can be hidden, and users can control who can comment through "Comment Controls." Furthermore, commenting can be disabled for specific posts. These technical features significantly contribute to Instagram's overall credibility by empowering users to manage their interactions and content effectively.

Real-world feel. This principle postulates that if a system emphasizes the individuals and organizations behind its content and services, it becomes more persuasive. Instagram offers options to contact specific individuals by sending feedback through messages or comments. Moreover, Instagram enhances the user experience by enabling live broadcasting, providing tools to report abusive content, and personalizing the interface based on users' preferences.

Authority and Third-party endorsements. Initially founded by Kevin Systrom and Mike Krieger (Eldridge, 2023), Instagram became part of "Meta," previously Facebook Inc, in 2012 (Reiff, 2022). Meta's established reputation endorses Instagram's credibility and authority (Reiff, 2022). To uphold authority, Instagram enforces copyright rules to protect users' content and endorses brands and creators with verified badges.

Verifiability. The verifiability principle suggests that a system's credibility and persuasiveness increase when it allows easy verification of its outcomes from external sources. Instagram facilitates linking to external websites with a single click, enabling users to verify and gather more information about a product or service. Through the "Shop" feature, users can connect to external websites to access customer reviews and obtain enhanced details about the offered products or services.

Category of social support

The PT principles falling under the category of social support justify designing the system to motivate users through the utilization of social influence techniques for persuasion. The following sections outline the PT techniques identified in Instagram that align with the social support category.

Social learning. This principle advocates that a system should offer opportunities to observe other users engaging in the target behaviours and witness the outcomes. Instagram, being a social media platform, facilitates learning from others to create content and employ internet strategies. For instance, users viewing stories can download the filters used in those stories for their use. Moreover, the platform offers various interactive stickers like 'Question,' 'Add Yours,' 'Quiz,' and 'Poll' stickers, enabling users to engage and communicate with others.

Social comparison. This principle asserts that the system should offer means for users to compare their performance with that of other users. In Instagram, users can assess the reach and engagement of their posts by comparing the number of likes and comments with those of other users' posts.

Normative Influence. This principle emphasizes the gathering of individuals with similar goals and fostering a sense of community norms. Instagram facilitates this through features like giveaways and promotions that connect Instagram influencers, aligning them toward a common objective.

Social Facilitation. The social facilitation principle suggests that users are more inclined to engage in a target behaviour if they perceive that other users are also engaging in the same behaviour. On Instagram, this is evident when users proceed to comment on content after observing others' comments. This behaviour is driven by the tendency of users to follow suit upon witnessing others' actions.

Co-operation. The principle of cooperation posits that a persuasive system can encourage users to adopt a targeted attitude or behaviour by tapping into the inherent inclination of humans to collaborate. Instagram, akin to other social media platforms, utilizes comments on content related to a product or service. New users on Instagram feel motivated to embrace a behaviour based on the comments and reviews of other users. This principle is also reflected in the exchange of questions and answers provided by users for specific content. Consequently, users cooperatively aid each other in making decisions about adopting behaviours.

Competition. This principle suggests that a system can motivate users to adopt a targeted attitude or behaviour by tapping into the natural human tendency to compete. On Instagram, indirect competition among users is evident, as the number of followers significantly determines recognition and potential earnings from branding or promotions. Additionally, Instagram users engage in competitive activities, such as participating in giveaways where users compete for prizes. This competition motivates users to adhere to specific guidelines, such as sharing, liking, and mentioning other users in the comment section of pinned posts associated with giveaways. Consequently, due to this competitive environment, the number of followers and the profile reach of the stakeholders initiating the giveaways tend to increase.

Recognition. This principle suggests that a system should offer public recognition to users who exhibit the desired target behaviour. Instagram, being a social media platform, showcases success stories and personal anecdotes from its users, thereby providing significant recognition and impact for users within the platform.

Summary of Major Findings

This study aims to assess Instagram using the PSD framework by identifying PT techniques implemented on the platform. The previous section's findings extensively explored the operationalization of each identified PT technique within Instagram. The aforementioned findings are summarised in Tables 3, 4, 5, and 6.

Table 3: Summary of PSD Principles Implemented by Instagram – Primary Task Support

Persuasive Principle	Implementation in Instagram
Reduction: A persuasive system should reduce a complex task into smaller ones.	– Create a new account by login with the Facebook account or email or phone number – Switch to a different account without logging out from the existing account. – Instagram Direct, Stories Archive – Find people from the device's contact list and recommendation of accounts to follow on Instagram. – Search bar for searching users and generation of QR codes in a single click. – Report link near the content itself. – Recover password by tapping Get help logging in. (Android) or Forgot password? (iPhone).
Tunnelling: A persuasive system should guide a user through a process while persuading the user along the way	– Find a contact from the mobile phone for finding Instagram users. – The view shop-cart button directs the website of the product. – The tag feature enables direct to the tagged peoples' profiles using a single click on the post. – Instagram content provides step-by-step instructions for acquiring products or services. – Instagram content provides referrals to the originating company's website. – Can purchase from shops that already followed. – Can discover new shops on Instagram shop and can save products into the wishlist. – Shop on Instagram can be found along the way from the following components: – Infeed and Explore, in stories, in reels, in live, in IGTV and in shops on Instagram
Tailoring: A persuasive system should adapt the information to specific user groups	– Instagram provides a flexible interface to personalise the content. – Instagram content provides step-by-step instructions for acquiring products or services. – Instagram content provides referrals to the originating company's website.
Personalisation: A persuasive system should offer personalised content to individuals.	– Instagram predicts user preferences and on-site behaviour. – Instagram personalise future content recommendations to each user. – Use of cookies. Further, a user can also follow personalised content. – Hide the story from undesirable users.

	– Various options and technical features to create content in video resolution and video ratio. – Personalised content adds (advertisements.) – Allow business partners to boost branded content posts and stories. – Offers various filters, augmented reality filters, interactive stickers, effects, music, or audio to personalise the story or reel content. – An advertiser could show ads to people with certain interests
Self-Monitoring: A persuasive system should enable users to monitor the performance and progress	– Users can track the performance and reach from the Insight option. – Users can store the stories in the highlights section. – The reach of the content can be analysed from the "Actions" sections. – Users can learn about the audience regarding how many eyes were on the post and statistics about people's age range, gender, and destination. Allows users to create their hashtags and check out which ones other competitors are using.
Simulation: Persuasive systems should allow users to see the link between cause and effect	– A brand can share its product in posts or stories with and without its products to simulate users. – Users can promote upcoming Live video sessions through posts or stories to get the word out beforehand. – Users can try using the Q&A feature or give shoutouts to commenters while broadcasting is going on to boost engagement and hopefully persuade users to buy badges.
Rehearsal: Persuasive systems should allow users to rehearse a target behaviour	– Instagram provides a guide in terms of help options for new users, – Users can view a short part of the video rather than buffering the whole length video. – If the user prefers to view the whole video Instagram provides an IGTV option. Instagram "Reels" allows users to record and edit short videos for up to 60 seconds in the Instagram Camera.

Table 4: Summary of PSD Principles Implemented by Instagram – Dialogue Support

Persuasive Principle	Implementation in Instagram API
Praise: Persuasive systems should offer praise to be more persuasive	– Instagram users (Followers) can praise other users' content by liking, sharing and commenting on them.
Rewards: Persuasive systems should offer rewards to encourage users to keep carrying out the target behaviour.	– Various ways to earn money for a content creator. – Badges, monetise videos with ads and giveaways.
Reminders: Persuasive systems that remind users of the target behaviour are likely to be more persuasive.	– Notification option. – Set daily reminders on the activity option.
Suggestions: Systems that offer suggestions to users would be more persuasive.	– "Search and Explore", Top, Accounts, Tags, and Places categories during the search. – Separate flexible interface; feed and stories and first display the most popular content – Automatic suggestion for preferred content for every user. – Two ways to use Instagram; 'Mobile App" or "Web Profiles". – Suggestions for various types of advertisement; from "create ads" from the Facebook page of the users, to Link Facebook Page with the Instagram account. – Users can create ad campaigns in "Ads Manager" and Ads Manager provides comprehensive tools to create ads on Facebook and Instagram. – Suggestion to get a verified badge to be more authentic. – Able to link an Instagram account to an external website or web application. – Sensitivity content control, Sync the contact list with Instagram.
Similarity: Persuasive systems should behave similarly to their users.	– Offers equal opportunities and features to all users to create content.
Liking: Systems that appeal to the user are likely more persuasive.	– Visually attractive interface
Social role: Persuasive systems should take up a social role	– Offers various ways to initiate community campaigns to make a socially connected society – Allows a user to start a live broadcast to connect with followers in real time. Users can share replay access in the Live Archive.

	− Enables users to create a "nonprofit fundraiser" that will live in the bio for 30 days and a "Donation Sticker"
	− Instagram makes sure that every user of Instagram sees relevant and useful ads.
	− Emphasises that all ads on Instagram must follow "Community Guidelines and Advertising Policies".
	− Additional policies for ads shown to young people, Sensitive content control.

Table 5: Summary of PSD Principles Implemented by Instagram – System Credibility Support

Persuasive Principle	Implementation in Instagram API
Trustworthiness: A persuasive system should provide truthful, fair and unbiased information to its users.	− Secured API for sharing personal information. − Verified badges, Able to report the bullying, Able to block the undesirable person − Two-factor authentication for the account, public or private accounts upon preference.
Expertise: A persuasive system should provide information showing knowledge, experience, and competence.	− Instagram provides information about updates regularly. − "Instagram Lite" uses less data.
Surface credibility: A persuasive system should have a competent look and feel.	− Instagram is professionally built, visually appealing, and easy to understand the way to use by novice users. − The number of advertisements is limited on the web and mobile versions of Instagram. − Restricted Comments with the "Restrict" option, Direct Message Settings. − Block People, Tags and Mention Settings, Pinned Comments, Comment Filter, Comment Controls
Real-world feel: A persuasive system should provide information about the organisation and the actual people behind its content and services.	− Sending feedback via messages or comments. − "Live", Reporting abusive content, Personalising the interface based on the users' preferences
Authority: A persuasive system should refer to people in the role of authority.	− Instagram is owned by "Meta", which was previously known as Facebook Inc.

Third-party endorsements: A persuasive system should provide endorsements from respected sources to its users.	− Various copyright rules on using Instagram. − Contents are endorsed by brands − Instagram endorses creators through verified badges.
Verifiability: A persuasive system should provide ways to verify the accuracy of the content from outside sources.	− Users can be directed to external websites through one click in the bio section. − Instagram "Shop" can be linked to the external website of the business.

Table 6: Summary of PSD Implemented by Instagram – Social Support

Persuasive Principle	Implementation in Instagram API
Social learning: A persuasive system should provide ways to observe other users who are performing the target behaviours and to see the outcomes of the behaviour.	− Users can learn from others to create content and use Internet strategies − The filters from the story can be downloadable for personal use. − Use of interactive stickers such as "Question", "Add Yours", "Quiz", and "Poll" stickers.
Social comparison: A persuasive system should provide some means for comparing performance with the performance of other users.	− Users can check the reachability of other posts regarding the number of likes, comments, and shares.
Normative influence: A persuasive system should provide ways to gather people who have the same goal and make them feel norms.	− Instagram allows giveaways and promotions by gathering Instagram influencers on the same line.
Social facilitation: A persuasive system should provide ways for discerning other users who are performing the same behaviour.	− Users move ahead to comment on content upon seeing other people's comments on the same content.
Co-operation: A persuasive system should provide ways for cooperation with other users.	− A new user on Instagram feels motivated to adopt a behaviour based on other users' comments and reviews.
Competition: A persuasive system should provide ways to compete with other users of the same system.	− Instagram users indirectly compete with other users as the number of followers significantly determines the earnings from branding or promotion. − Instagram users compete among users to win prizes upon giveaways are announced.
Recognition: A persuasive system should provide public recognition for users who perform their target behaviour.	− Instagram carries success stories and personal stories

Conclusion

This paper employs the PSD framework, a tool for developing and evaluating persuasive systems, to assess Instagram. In this study, the first and second phases of the PSD framework are utilized to justify Instagram as a persuasive system. Additionally, this research investigates the implementation of PT principles in the third phase, specifically focusing on system feature design. Notably, primary tasks and dialogue support employ persuasive techniques adequately within Instagram.

The examination of Instagram's features revealed that one element often aligns with multiple PSD persuasive principles. For instance, the 'Search and Explore' feature serves as an example of both the reduction principle by simplifying searches through keyword input and the suggestion principle by recommending accounts, hashtags, and places during the search. Similarly, the verified badge aligns with the principles of trustworthiness, verifiability, and recognition. To streamline the presentation of results, the persuasive features on Instagram have been organized under the most appropriate principles.

In evaluating Instagram through the lens of the PSD framework, this study has provided a comprehensive examination of the persuasive elements employed in Instagram. By employing the three phases and 28 elements in the PSD framework, focusing on four main categories such as primary tasks, dialogue support, system credibility, and social supports, this study aimed to uncover and evaluate the underlying PT techniques embedded within Instagram. This study revealed that Instagram effectively integrates numerous persuasive elements, demonstrating alignment with reduction, suggestion, trustworthiness, verifiability, and recognition principles across its features. However, while Instagram excels in certain aspects, our study underscores room for improvement. The identified gaps in implementing reminders, social comparison, social facilitation, normative influence and cooperation pose challenges in solidifying Instagram's persuasive capabilities across all PSD principles. Addressing these gaps could significantly enhance the persuasive influence of Instagram.

Limitations and Future Works

This study delved into the elements of PT within Instagram from the researcher's (author) and the expert's standpoint, without considering the perspectives of users. Undoubtedly, examining the PSD principles from the user's viewpoint would yield additional informative outcomes. Furthermore, conducting additional analyses to ascertain the significance of the identified elements and PSD principles from the perspectives of both users and experts could enrich the findings. Such analyses would aid developers of social networking systems and content creators in prioritizing which elements or features to employ initially. Consequently, a user study and expert evaluation are proposed to address the following objectives: validate the effectiveness of PSD principles in Instagram or social media in general and develop a measurement model to gauge the persuasive effectiveness of each identified PT feature.

Moreover, observing the behaviour of actual users may yield more precise results concerning how PSD principles influence user behaviours. Additionally, it is important to note that this study solely focused on Instagram; therefore, generalizing the results to other social media platforms might not be confidently viable in the long term.

Acknowledgements

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