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Measuring the effectiveness of digital communication – social media performance: an example of the role played by AI-assisted tools at a university

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Abstract

The aim of the article is to show the role played by AI-powered tools in measuring the effectiveness of digital communication in social media using a university case study. Therefore, a research problem was formulated to identify the metrics (KPIs) used to measure the effectiveness – non-financial outcomes – of digital social media communication at the university using AI tools.

The literature review on the role of AI in digital marketing in social media showed that it is used, inter alia, to measure the effectiveness of digital communication – social performance.

The importance of KPIs in digital marketing – indicators for measuring non-financial performance – and the presentation of tools used to analyse the effectiveness of social media campaigns were based on a case study of a higher education institution in Poland. With the application of AI tools (such as ContentStudio, HelloWoofy or Sotrender etc.), it is possible to automate analytical processes for KPIs such as reach, engagement, content or customer service, among others, as well as systematic reporting. This, in turn, provides opportunities to systematically monitor and make improvements to the implemented social media marketing communication strategy – to create a kind of Decision Support System (DSS) to support the aforementioned process.

The study is introductory and exploratory in nature. It indicates the importance of tools using AI in business practice – using the case study of a university as an example.

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1. Introduction

"Traditional marketing is all human, all the time. But artificial intelligence possesses the power to change everything " [1]

Paul Roetzer
(Marketing Artificial Intelligence Institute)

"Overall, artificial intelligence is transforming social media by making it more personalised, efficient, and effective. As AI technology continues to improve, we can expect more innovative applications and use cases to emerge" [2]

Tamara Biljman

The use of social media by market players is growing as the digitalisation process continues. At the same time, their role in the marketing communication process with audiences is growing. The consequence of this phenomenon is the amount of data that continues to expand and the need to analyse it [see 3]. This is why measuring the evaluation of marketing performance has been defined as one of the key areas in marketing by the Marketing Science Institute as a *"Research Priorities"* for 2022-2024 [4]. This shows the relevance of this area in terms of marketing research.

With the help of marketers come modern technological solutions and tools based on these technologies. Examples of such solutions are programmes based on artificial intelligence. Modern systems for measuring the performance of activities undertaken – including, in the areas of digital marketing and social media – mean that innovative metrics are emerging and key performance indicators (KPIs) are changing for marketing managers [5]. The existence of modern performance measurement systems in marketing is underpinned by modern technological developments, including artificial intelligence (AI) (see Figure 1).

The technological revolution happening before our eyes means that we are now experiencing an AI-assisted digital transformation. Existing platforms based on artificial intelligence technology can "not only compute user behaviour data, web analytics and demographic information. They also spot trends and patterns before a human does" [6]. Marketing professionals can then use these insights to make their content more relevant, increasing the likelihood of customer engagement [7]. In addition, "marketing algorithms can optimise ad placement and bid prices"[5].

AI-based tools are ubiquitous in marketing. They bring with them a number of challenges in addition to their obvious advantages [8]. Artificial intelligence – AI-based solutions – put tools in the hands of marketers to analyse large amounts of data more quickly [9] and, as a result, improve performance and gain competitive advantage. The use of AI-based tools in social media marketing offers a number of benefits in terms of KPIs, from user engagement, tailoring content to audiences, better insights into performance and achieving higher ROI [6]. Mordor Intelligence estimates that the social media AI market is expected to reach US\$3.7 billion by 2026 [10].

The rapid process of AI-driven digital transformation is now being seen in all industries globally. The process of the AI revolution is also encroaching on universities, as was discussed at the AMA conference "Marketing in Higher Education" on 11–12 April, 2023. Even if there is a lack of awareness, it is AI solutions based on this technology that are commonly used in the marketing activities of universities, especially when it comes to social media.

Therefore, the following research problem was formulated: what measures (KPIs) are used to measure the effectiveness – non-financial performance of digital social media communication at a university using AI tools?

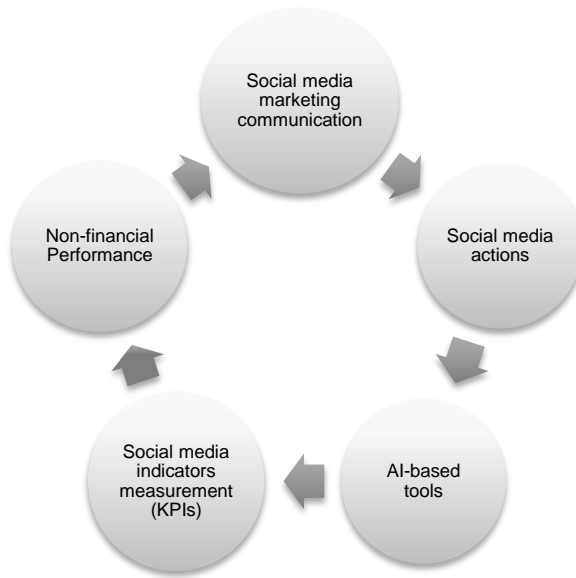


Fig. 1. AI-powered tools in measuring the effectiveness (KPIs) of digital communication in social media – Decision Support System (DSS)

The assumptions of the marketing decision support system (DSS) within the framework of digital communication in social media are shown in Figure 1. All activities undertaken within the framework of social media marketing communication are measured – using artificial intelligence-assisted tools – regarding their effectiveness (KPIs) – considered as a non-financial outcome of marketing activities – and then, based on the indicators obtained, appropriate decisions and actions are taken for further social media communication policy.

2. Literature review

2.1. Digital marketing KPIs for social media

There is an ongoing discussion in the literature [11; 12; 13] about the use of indicators that should be analysed and reported as KPIs. This is necessary for the subsequent evaluation of return on investment (ROI) of social media [14]. Among the key areas that should be included in social media performance reports should be the following [15]:

- new followers – the number of followers is not the most important metric, but it should be constantly raised.
- reach – this measure refers to the potential unique audience that a post can attract. Increasing reach, therefore, should result in an increased audience.
- engagement – these are shares, comments or likes. These indicators convey that the content published is of interest and that its audience wants to interact.
- posts – this metric indicates audience trends. It indicates posts that are generating interest. Observing the correlation between the number of posts and engagement gives information on the direction of communication efforts.
- traffic – increased website traffic resulting from social media activity, which can be measured using Google Analytics. It provides important information on the effectiveness of social media marketing activities.
- conversions – this is the most important metric used to assess financial ROI. Google Analytics can be used to determine the performance of social media advertising by setting conversion goals.
- clicks – these are clicks on links, clicks related to promotion (ads, posts) or other. This indicator shows the attractiveness of the content.

Measuring the effectiveness of digital marketing activities plays a key role in optimising online activities, with a particular focus on social media. The most important metrics for measuring non-financial social media marketing performance [16] include [17]: reach, impressions, audience growth rate, engagement rate [8], amplification rate, virality rate, video views, video completion rate, customer satisfaction (CSAT) score, net promoter score (NPS), click-through rate (CTR), conversion rate, cost-per-click (CPC), cost per thousand impressions (CPM), social share of voice (SSoV), social sentiment [18].

The nature of social media offers the opportunity to track almost any metric, which at the same time creates the difficulty of selecting those metrics that are most relevant to the objectives [17]. Understanding which metrics are most important to a company is the key to success. "Social media metrics are the data points that show you how well your social media strategy is performing" [17]. That's why, tracking multiple KPIs is essential for looking at the effectiveness of your social media efforts holistically, which monitoring only a selected metric does not provide. Holistic systematic KPI reporting is essential for determining the financial ROI for social media activities undertaken. Artificial intelligence-based tools can help measure the effectiveness of social media activities.

2.2. AI tools for digital marketing and social media non-financial indicators performance

The growth of artificial intelligence (AI) based technologies means that there are many AI tools available on the market that can be used, for example, for social media management, content creation, analytics and more. 10 recommended AI global tools for social media are listed below [19]:

- Flick,
- ContentStudio,
- Lately,
- SocialBakers/Emplifi,
- Heyday,
- Wordstream,
- Cortex,
- QuillBot,
- Linkfluence,
- HelloWoofy.

Each of the above-mentioned tools uses artificial intelligence to assist in the effectiveness of social media marketing communications. Depending on the tool, it supports one (e.g. Flick – Instagram analytics tool) or a set (e.g. ContentStudio or Lately) of social media in the following areas [10]:

- content creation,
- idea generation,
- sentiment analysis,
- content optimisation,
- reporting and analytics,
- customer service.

The key area, from the point of view of the study topic undertaken and the research problem formulated, is the analytical area. It focuses on the analysis and generation of reports presenting specific indicators, depending on the social media, allowing the evaluation of the results of the marketing campaign and increasing the effectiveness of the next steps in communicating with social media users.

Flick is an AI-powered tool that facilitates analytics for one social media, Instagram [20]. With the assistance of this tool, it is possible to determine account performance and formulate a content strategy. With Flick's Instagram Analytics tools, it is possible to track real-time metrics such as reach, competitor performance and engagement rates. The tool provides the ability to track hashtags to determine the effectiveness of posts. Flicks gives more tracking



metrics than the stats built into Instagram, these include tracking conversion rates, time spent ranking for hashtags on Instagram and content engagement and reach metrics.

ContentStudio is another AI-based tool [21] which enables the monitoring and analysis of social media performance. In contrast to Flicks, it enables multi-channel social media analytics as: Facebook, Instagram, Twitter, LinkedIn and Pinterest. It allows the measurement of indicators such as total engagement, audience growth, best-performing posts and much more [22]. It also allows specific social KPIs to be compared with top competitors. Reports are generated automatically, at a predetermined time, and sent to the marketer's email inbox. ContentStudio provides social media analytics (for example: your best content, sentiment analysis, best-performing day, best time to publish, best hashtags, etc.) so that an effective social media strategy can be developed.

Another AI-based tool enabling, among other things, effective analysis of social media statistics and improving the results of marketing communication with the audience is Lately [23]. This is a tool whose main purpose is to engage social media users through content that is tailored for them. For this purpose – in addition to A.I. Content Writer – Lately's Social Media Analytics tool is used, which analyses the reach and engagement of each post and gives recommendations for future actions to better tailor content to audience. Lately helps analyse metrics simultaneously across multiple channels. The tool uses what is known as an artificial social intelligence engine. This is a continuous process of AI learning your existing social media posts and building a model based on the most engaging forms.

Similar functionality is available with Socialbakers (Emplifi) [24]. SocialBakers, with its AI-based solutions, enables multi-channel management by, for instance, using an analytics dashboard and intelligent tools to plan optimal posting times. Socialbakers (Emplifi) allows to define own social media metrics – including industry metrics – that can then be customised with unique KPIs and business objectives. Socialbakers (Emplifi), through AI and automation, enables the transformation of disparate data into actionable insights.

Application in other areas than those discussed so far is exemplified by another AI tool, **Heyday** [25]. It is a conversational AI tool for social media. With natural language processing (NLP) and natural language generation (NLG) functions, it interacts with people in real time. In addition, it creates content for bots. From an analytical point of view, Heyday tracks and measures, for example, customer satisfaction scores, average response time and other metrics to make informed decisions. As the company (the programme's creator) states, "with Heyday, we're able to combine the power of advanced automation and live chat to connect with our customers on multiple channels, in multiple scenarios" [25]. Heyday is the recommended AI tool for e-commerce. It features a chatbot that responds to customer messages, track orders and automate with FAQs (*frequently asked questions*).

A tool designed to improve the performance of PPC ads on social networks based on AI, specifically machine learning (ML), is Wordstream [19; 26]. One free tool is the Facebook Ads Performance Grader, which helps audit an account. Facebook Ads Performance Grader provides information on the audience of ads on Facebook, Instagram and Messenger and at the same time on whether they are the right audience for the ads and on whether the objectives of the campaign support the business objectives.

Cortex is an AI tool for sharing optimised content on social media. Based on historical data of social media publications, it analyses metrics and suggests the time and manner of publication, as well as the colour scheme, e.g. for published images, that would be most engaging for the audience. The programme also generates competitor data [19; 27]. Cortex is an AI-based tool that helps analyse all digital marketing channels and, as a result, shows which activities will engage audience. The audience's activity and responses can be tracked across channels. This knowledge may maximise the ROI of any content.

QuillBot is an AI social media tool for reusing existing content by paraphrasing or summarising it [19; 28].

Linkfluence (Meltwater) monitors, analyses and manages all social media channels [19; 29]. It can predict and analyse customer trends. It also has a function to measure the evolution of brand identity on social media. AI is used to remove spam and false data sets from the analysed data, resulting in more accurate content analysis results.

HelloWoofy is a cloud-based social media management platform [19; 30] that can automate marketing across all the top social media platforms including Twitter, Facebook, Instagram and TikTok. The platform includes a range of options for content management, intelligent scheduling or campaign management. HelloWoofy is integrated with more than ten social media platforms such as Facebook, Instagram, Twitter, LinkedIn, TikTok, Snapchat, Pinterest etc.



An analysis of the ten recommended as the best tools using AI demonstrated their diversity from the number of social media in which their application can be made, to the range of areas in which it can be used, to the analytical capabilities. The most versatile – the ability to simultaneously manage multiple social media platforms and analytical capabilities in multiple areas – are tools such as ContentStudio and HelloWoofy.

3. Research methodology

In order to solve the research problem formulated in the introduction: "what measures (KPIs) are used to measure the effectiveness – non-financial performance – of digital social media communication at a university using AI tools?" the following steps were taken:

- literature analysis,
- analysis of secondary sources,
- case study.

The first step looked at the metrics used to measure the effectiveness of activities undertaken in digital marketing, including social media. A literature analysis of the following sources was carried out: WoS, Scopus, Google Scholar. This helped identify the most commonly used non-financial performance measures of social media marketing activities, which are discussed in section 2.1. The key areas and associated metrics (KPIs) that should be included in social media performance reports were discussed: which of them should be analysed, reported and, in a subsequent step, used to assess the return on investment (ROI) of social media?

In the next stage – using secondary sources – an analysis was conducted of the available and recommended AI-based tools on the market, which can be used in digital marketing and social media in particular to enhance social media marketing communication. These were discussed in section 2.2. The essence – from the point of view of the research problem – was to identify their functionality by analysing key indicators measuring the non-financial performance of digital social media marketing campaigns.

The last stage was the presentation of a case study – a Polish university using tools based on artificial intelligence in its marketing communication activities in social media to measure the effectiveness of activities and take steps to increase it. The case study aimed to "identify a current phenomenon in real-world settings" [31], namely the role of AI tools in measuring the effectiveness of digital communication and social media performance.

4. Research results and discussion

The analysis of the example AI tools for digital marketing showed that some of them can be used to analyse the effectiveness of social media communication. Selected indicators that can be measured using the AI-based tools discussed are listed below:

- audience growth,
- fans count,
- sentiments,
- feedback,
- reactions,
- comments,
- likes,
- shares,
- reposts,
- post per day,
- total engagement,
- engagement per day,
- popular day,
- popular hashtags.



The metrics used to measure the effectiveness of communication with audiences depends on the tool and the needs of its user, as well as the purpose of the analysis. Analytics of marketing communication activities with audiences via social media can:

- determine the effectiveness of campaigns,
- effectively segment message recipients and appropriately target messages,
- constantly monitor key KPIs for the company,
- increase the effectiveness of social media activities.

Examples of performance indicators used by a public university to analyse the effectiveness of marketing communications on the Facebook platform are shown in Table 1.

Table 1. Selected performance indicators for marketing communication on Facebook of the university under study.

Areas analysed	Non-financial performance indicators (KPIs)	Indicator characteristics*
Reach	Coverage and displays	The total reach shows how many users were reached by the communication, while the number of impressions shows the total number of times it was the total number of times it was displayed. The average number of contacts helps to estimate how often a single user is reached - it is usually assumed in marketing that several contacts are necessary to make a message stick.
	Types of reach	The different types of reach show how a brand's communication reaches users. Organic reach depends primarily on the number of fans of the profile and the attractiveness of the communication.
	Fan growth	The number of fans is the simplest indicator of a profile's visibility. It also influences the organic reach of the communication.
	Demographics of fans	Analysing fan demographics helps answer the question of which groups of people, with which demographic characteristics, make up the largest proportion of a page's fans. This knowledge not only helps you to adapt and prepare messages to your audience accordingly, but also to activate or attract those groups of people who are less numerous but also valuable to your brand.
	Demographics of reach	Analysing the demographics of reach makes it possible to determine whether the communication is reaching its main target groups and in which segments is increasing and decreasing.
Engagement	PTAT (People Talking About)	The number of people who create stories on a site. Stories include various user actions on organic as well as paid content of the site.
	Relative PTAT	As above - in relative terms.
	Engaged users	The number of engagements indicated the intensity of the response to the brand's communication.
	Engagement by day	Engagement users rate in terms of days.
	Engagement by hour	Engagement users rate in terms of hours.
	Types of engagement	Facebook users can engage with a brand's profile in different ways. Their activity will also be visible to their friends, so the "viral" reach of the content can be boosted.
Types of response	Reactions help Facebook users communicate their feelings about a topic. They can press - like, love, care, haha, wow, sad and angry. Reactions are a great source of additional insight for brands.	



	Sentiment	Users can react to profile posts in a positive way (like, love, care, haha, wow) or negative (sad or angry). However, a high proportion of negative reactions do not always have a negative response - much depends on the content published on the profile.
	Interactivity Index (InI)	The Interactivity Index is an aggregate indicator of engagement. Like the number of engagements, it tells us about the intensity of the response to the brand's communication and takes into account the different types of activity and the fact that 1 user can perform multiple activities.
	Relative Interactivity Index	The value of the Interactivity Index (InI) compared to the previous corresponding period.
	Interactivity Index by day	Interactivity Index (InI) in terms of days.
	Interactivity Index by hour	Interactivity Index (InI) in terms of hours.
	User segmentation	Behavioural segmentation of engaged users gives a better understanding of how they engage on a given profile and how this is influenced by ongoing activities. In addition, the users in individual segments can be seen.
Content	Types of brand posts	Facebook allows the use of various forms of communication. It is advisable to make use of this possibility, taking into account the specific characteristics of the brand.
	Top brand posts	An indication of the best (most effective) brand posts, which triggered the highest engagement in a given period (achieved the highest Interactivity Index value).
Customer service	Response to user posts	Social media is a two-way communication, and users often take the opportunity to ask questions, complain complaining, or simply tagging brands in their posts. It is worth responding to these voices, dispelling doubts and reinforcing positive signals.

Source: Data from the performance analysis report for the Facebook marketing communications of the university under study developed using the AI tool Sotrender for 2022.

* Descriptions of the individual indicators provided in the 2022 reports analysed.

As part of the summary, the following effectiveness indicators are presented in the reports:

- number of users, reach (number of fans, total reach, breakdown of reach into organic, paid, viral),
- types of engagement (shares, comments, reactions),
- engagement (number of engagements, percentage of engagements, PTAT, relative PTAT, Interactivity Index, relative Interactivity Index),
- top posts,
- customer service (user posts, with brand response, speed (median)).

Information on the effectiveness of the actions taken is the starting point for the next steps in communication with the audience. The above indicators and report were generated using an AI-based programme used on the Polish market, which is Sotrender. This is a programme that can be used for analytics on Facebook and Instagram activities. It may help:

- monitor the effectiveness of sentiment analysis of advertising activities and organic content on FB and the effectiveness of published content, audience preferences and demographics on IG,
- generate comprehensive reports at any time and have constant access to historical data,
- analyse and report on the paid and organic performance of direct competitors and the industry as a whole.



The aforementioned reports show the university's relevant KPIs in relation to marketing communication objectives and the degree to which they have been achieved, as well as in the context of the marketing strategy pursued. Continuous monitoring in this area is only possible with AI-based tool(s), which increases efficiency in the area of social media analytics by reducing the time needed to systematically generate the reports necessary for effective management of marketing communication with the right audiences on social media.

5. Conclusions and research limitations

The increasing amount of data available to marketers because of the widespread use of social media for marketing communications with audiences makes AI-based tools an essential tool for every marketer. AI-based tools presented represent a diverse range of their use – they are not standardised. This raises the difficulty for marketers to select the right tool – fully tailored to their needs, also in terms of social media analytics.

As we can see from the tools discussed for digital marketing, AI is used in the best analytics programmes to measure the effectiveness of your social media efforts. Artificial intelligence-based tools help perform social media analytics in one place – with one tool. This can increase performance by monitoring metrics that inform of areas that need to be more efficient.

Measuring the effectiveness of digital communication – social media performance through the use of AI-based tools available on the market – should be carried out in a systematic manner. Ongoing analysis of social media KPIs (such as reach, engagement, content, or customer service), is possible thanks to these tools. This, in turn, provides the opportunity to assess non-financial performance in terms of the social media marketing communication carried out and, subsequently, to increase the effectiveness of the actions taken on the basis of the results obtained. The key to the effectiveness of actions taken is the analytics of actions taken, using a set of KPIs appropriately selected for the specificity of the activity. Such a systematic approach to measuring the effectiveness of digital communication in social media is possible thanks to the use of AI-powered tools supporting the monitoring of results, through automatically generated reports for strictly defined sets of KPIs at a fixed time, which are delivered to a designated inbox of the recipient. The development of such a decision support system (DSS) for social media marketing communications increases the effectiveness of marketing activities, allows the development and ongoing modification of communication strategies for social media, and ultimately, after taking into account the financial outlay, allows the financial performance (ROI) of social media activities to be assessed.

For marketers, these AI-based tools facilitate their day-to-day work by enabling them to analyse large amounts of data in a short space of time and monitor the situation on an ongoing basis, resulting in an increase in the effectiveness of their social media marketing communication strategies. Compared to the cost, this pays off – the benefits outweigh the expenses.

Among the main benefits achieved by marketers through the use of AI-based tools in social media, there are two main ones: increased efficiency and accuracy, and reduced costs. The use of AI-based solutions makes it possible to automate many tasks related to idea generation, optimising content creation and analysing the performance of social media activities, among others. The aforementioned automation, in addition to increasing the efficiency and accuracy of operations, allows for a reduction in social media management and marketing costs [see 32]. AI-powered tools (e.g. ContentStudio and HelloWoofy) allow data to be analysed in a much shorter time than the work of analysts. In addition, targets are achieved faster, more accurately and with less expense. They relieve marketers of routine tasks allowing them to focus on more creative work, thereby increasing the final effectiveness of social media campaigns.

Limitations include the exploratory nature of the survey and the limited availability of data from companies, which resulted at this stage in the possibility of using the case of a single entity – a university. This also results in the study being limited to one market. These limitations point to research directions for the role of AI-based tools in measuring the effectiveness of marketing communications and evaluating social media performance. As the next phase of the study, qualitative research on marketing managers is planned.

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