

## Article

# Harvesting Crowdsourcing Platforms' Traffic in Favour of Air Forwarders' Brand Name and Sustainability

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**Abstract:** In the modern digitalised era, the total number of businesses and organisations utilising crowdsourcing services has risen, leading to an increase of their website traffic. In this way, there is plenty of space for marketers and strategists to capitalise big data from both their own and the crowdsourcer's websites. This can lead to a comprehension of factors affecting their brand name, sustainability (gross profit) and consequently visitor influence. The first of the three staged contexts, based on web data, includes the retrieval of web data analytics and metrics from five air forwarding and five crowdsourcing websites in 210 observation days. At stage two, we deployed a diagnostic-exploratory model, through Fuzzy Cognitive Mapping (FCM), and in the last stage, an Agent-Based Model is deployed for data prediction and simulation. We concluded that crowdsourcing referral traffic increases air forwarders' top 3 keywords volume, and decreases social traffic and total keywords volume, which then boosts their global web rank and gross profit. The exact opposite results occur with crowdsourcing search traffic. To sum up, the contribution of this paper is to offer realistic and well-informed insights to marketers about SEO and SEM strategies for brand name and profit enhancement, based on harvesting crowdsourcing platform traffic.



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**Keywords:** crowdsourcing; air forwarders; web analytics; brand name; FCM; agent-based modelling; SEO; SEM

## 1. Introduction

Not yet commonly known or used by the totality of sectors, crowdsourcing has shown its huge potential in various projects and tasks usually processed by computers. According to Howe [1], crowdsourcing focuses on “taking and outsourcing a job, previously done by a designated agent, to an undefined and large number of people via an open call”. Crowdsourcing could be seen as a conflation of the terms “knowledge of crowds” and “outsourcing”. Each crowd member can complete and be assigned a project. They get paid for their work. Crowdsourcing forms a very appealing project completion method for both enterprises and crowd workers [2], thus leading to development of the most known crowdsourcing platforms and service providers. The need for businesses to adapt to service model performing ridesharing same-day delivery services is a phenomenon known as “Crowdsourced Logistics” [3].

Open data is the philosophy that some data should be available freely to anyone to use and republish as they want, without limitations on copyright, patents or other control mechanisms [4]. Big data is defined as the volume of data that lies beyond the ability of current technology to store, manage and process efficiently [5]. Web analytics refers to the measurement, selection and analysis of big data from websites, for the purpose of understanding and optimising web usage [6]. On that note, web traffic consists of the amount of data that visitors send to a website, from their web browser, and it is measured by the number of visitors (traffic) and the number of pages they visit. Moreover, visitors tend to visit a website after having searched for specific keywords that are linked to the intended website (keyword volume), adding up to the observable web traffic.

Utilisation of big data from websites has given the opportunity to many businesses to organise and plan their marketing strategies more efficiently. This is due to the large pool of available data consumers “leave” to websites at their visits. Crowdsourcing platforms can highly affect the firms’ recognition and popularity, and thus the brand name [7]. Their option of digital marketing strategies, web visitors’ capabilities etc., affect visitors’ choices regarding their interaction with the elements of the page. Thus, the more traffic a website has, the higher the rank it acquires in terms of SEO and SEM. From there, it is a matter of marketers to successfully imply the web data to their favour and benefit the firm’s brand name.

In this research, we mainly focus on examining the effect that is induced when an air forwarder’s web analytics from outsourcing activities to crowdsourcing platforms (we use their web analytics too), when the air forwarder firm’s global rank and gross profit are increased or decreased. In other words, we intend to test whether an increase or decrease in air forwarding the sector’s type of traffic/keywords, in terms of their relationships with crowdsourcing websites traffic (positive or negative), causes a significant variation in their gross profit and web ranking. Extensively, we use gross profit and global web rank as a variable of the firm’s financial brand name, sources of traffic, and types of keyword usage as subsets of webpage analytics.

### *1.1. Crowdsourcing and Crowdfunding as a Strategic Tool*

#### *1.1.1. Importance of Crowdsourcing and Crowdfunding*

In the typical outsourcing strategy, an organisation subcontracts parts of the manufacturing process or some activities to a third-party supplier. This is mainly due to cost savings or the need for a subcontractor’s know-how for this particular project. In order to optimise the advantages of the outsourcing process, the firm carefully prefers to partner with the outsourcing contractor. Whereas, in crowdsourcing, the main difference is no specific contractor to integrate the task given, and it is rather given to the crowd, namely to a unanimous worker, to complete it. Between the firm assigning the project and the worker, a platform arises, a crowdsourcing platform, which handles the interface and arranges cases such as payment etc. Most firms recognise how essential it is to reach out to consumers and suppliers if they seek long-term growth [8].

Crowdsourcing and crowdfunding are very casual though highly effective strategies for reaching others, and have highly evolved during the last few years. The benefits of utilising crowdsourcing and crowdfunding are stated to provide improved costs, speed, efficiency, flexibility, robustness and diversity [9]. It has been used by start-ups, large companies, non-profit organisations etc. for the production of common goods or even services provision. In addition, benefits such as volume, referring to access to a massive number of human intellects, and quality, referring to “wisdom of crowds”, can be reached through use of crowdsourcing and open data.

Utilisation of crowdsourcing platforms in the digital sphere can serve as the foundation for the gathering and consolidation of big data with allusions to human activities, preference, and satisfaction rating. Once it comes to human behaviour, nevertheless, the use of big data and data mining to sustain complex dashboards that update consumers and the society about sensitive social data sparks a heated debate over the benefits and implications of these services to privacy and the security of data objects and subjects [10]. A component of crowdfunding’s rapid development may be ascribed to the nimble nature of reward-based initiatives, in which the reward of participation, for services or information, is explicit and specified in advance, unconstrained by the withdrawal liquidity considerations of a stock investment [11].

In this respect, acknowledgement of motivation sources during crowdfunding campaign design could lead to a business having enhanced and successful funds and sustainability [12]. It is a struggle to accommodate all users to the maximum capacity of their requests, and it is advised that in order for clients to be active in decision-making processes related to open data, the transition from a supply- to a user-driven open data strategy is a

crucial step in open data management [13]. Crowdsourcing gives businesses access to a huge amount of labour that can quickly complete necessary tasks at a fraction of the cost than if the same activities were conducted in-house [14], outperforming minor tasks that computers cannot easily handle. Crowdsourcing operations refer to a flexible on-demand outsourcing strategy [15].

#### 1.1.2. Air Forwarders' Strategy via Crowdsourcing/Crowdfunding

According to the IATA [16], there has been a marked further improvement of air forwarding demand in September, which has been driven by the relaxation of restrictions linked to COVID-19. This enabled companies to rebound quickly with gains in key economic indicators such as global manufacturing output and manufacturers' business confidence. In these times of uncertainty (such as with COVID-19), air forwarder companies should come up with strategic solutions to tackle these obstacles. In comparison to the first half-year traffic decline of 58.4% on the passenger market, forwarding appeared to escape sparsely with just a 14.5% decrease. In a way, predicting air cargo demand or reducing costs of manufacture or other domains of activity is essential. There are plenty ways of outsourcing any kind of task or project, but we mainly focus on crowdsourcing. A platform created by the IATA in 2019 (International Air Transportation Association) and based on crowdsourcing strategy is an open-source software called the National Centre for Atmospheric Research (NCAR), that helps planes avoid turbulence, with numerous benefits for freight carriers [16].

Even more logistics companies are outsourcing shipments to a rising amount of people through online platforms [17]. Crowdsourced networks and online platforms enhance the evolutionary shift to recast the old transactional relationship between providers and shippers, especially air forwarding cargo, to a more strategic and dynamic partnership [18]. Crowdsourcing Logistics offers a fast means of delivery, as carriers are independent contractors using privately owned vehicles to provide freight forwarding [19]. This may not directly concern air forwarding companies, due to the unavailability of public freight carriers, but Crowdsourced Logistics can lower transportation costs of delivered goods before and after the flight, thus benefiting all participating companies. Apart from Crowdsourced Logistics, crowdsourcing can contribute to air forwarding companies through crowdsourcing various business projects, if not the physical distribution one. Businesses are gradually using the model of crowdsourcing, through the development of ICT, to outsource tasks to the "crowd" [20]. The idea of "crowdsourcing" can make a valuable contribution to the supply of appropriate products or information at the right time and place [21].

Considering how good crowdsourcing/crowdfunding platforms are and the very negligible costs involved, it benefits the company to learn about how it might reach into these worldwide creative crowds. This enables an organisation to encourage growth through mass collaboration, and development is at the core of staying competitive [8]. Businesses are recently finding that the crowdsourcing strategy of organising labour can be applied to a wide range of tasks including applications such as marketing, manufacture, promotion etc. at a time when a lot of computing-related tasks are widely offered on the crowd-sourcing websites [9]. In crowdsourcing, instead of customers making generic ad hoc recommendations for new products, companies can explicitly tailor the sectors of production process that crowdsourcers are asked to work on. In this way, businesses are able to gain control of outsourcing their own projects to unknown clients. This enables further cost reduction due to the lower costs of crowdsourcing, and to the confinement of faults during the completion of an assignment.

Crowdfunding does have a number of elements identified, including specific information on the quality of the project, social networks, and analysis reports, as well as determinants such as the targets and timeframe of the funding, in order to develop successful programs that meet the funding preconceptions of the founders and society. We may also note that the use of crowdfunding campaigns has been entrenched over the previous decade as one of the Information and Communication Technologies (ICT) underlined for

this domain [22]. Mochkabadi and Volkmann [23] identify many interesting areas for future research for every aspect, such as capital market, entrepreneur and platform, to name a few, with a view of pertaining business sustainability due to the viable way of raising funds for its activities. This has also caused the advancement of technologies and the disposition of users. As Punel and Stathopoulos [24] found, there is a high usage percentage of crowdsourced shipping logistics activities, and this percentage is going up day by day [25].

### *1.2. Related Background in Businesses' Profit and Sustainability, Web Ranking and Crowdsourcing Traffic*

#### *1.2.1. Connection between Crowdsourcing Platforms' Traffic, Profit and Sustainability*

Crowdsourcing is not necessarily an "online" activity [1], but this does not impede collecting data. Data collection through crowdsourcing websites occurs due to companies seeking crowdsourcing platforms to assign projects. The most efficient way of reaching the crowd can be by online website platforms serving as channels for clients to connect with the crowd [26]. Open data access and reasonable pricing can lead more big and small businesses to visit crowdsourcing platforms, seeking product/service effectiveness. Based on Hirth et al.'s [27] findings, a crowdsourcing platform's owner can easily dimension the servers for the web page, so as to keep a constant crowd activity through the week, without influencing crowd workers.

Digital transformation and the multitude of technologies that enable broadly drawn and in-depth data analysis gives new optimisation options for businesses that were previously unachievable, with marketing becoming an analytical department, while still retaining a space for consumer empathy [28]. Analysis of big data, either within the firm or other platforms of interest, can assist the identification of a businesses' fields that require improvement, contributing to supply chain sustainability performance [29]. Firms operating in the supply chain (SC) sector can improve their supply chain and enterprise sustainability by considering various performance indicators based on big data mining techniques [30]. According to Kim [31], business managers seeking financial, and thus sustainable, growth should improve their technological and marketing innovations, among other variables. This highlights the close bond between sustainability and financial performance.

The crowdsourcing concept came from the fact that ideas and efforts can be freely shared through the web, with the rise of information technology [32]. With the rise in crowdsourcing demand and available data, the need to capitalise web data, such as web traffic, in favour of business profit is thriving, with big prospects for profit increase. According to Christensen and Karlsson [33], the benefits of crowdsourcing include better brand visibility and lower total costs, which can be related to increased profits in specific time periods. In addition, Schenk and Guittard [34] stated that part of using crowdsourcing platforms' services are benefits such as lower costs, lower risk and greater product/service quality. Crowdsourcing services might actually boost a company's R&D department, with multiple positive effects on their product/service and revenues [35].

Specific crowdsourcing traffic sources can be related to a firms' profit or web rank through various ways. Traffic types such as referral and search traffic interact with a webpage's web metrics, such as bounce rate and average session duration, giving a clear picture of visitors' intentions. Drivas et al. [36] found that search traffic positively affects the bounce rate and negatively affects the average visit duration of a webpage, meaning that high levels of search traffic could potentially reduce a firm's profit due to a higher visitor bounce rate and lower visit duration. On the other hand, referral traffic appears to have a positive impact on a firm's revenues due to their strong positive correlation [37]. In other words, since the importance of referral and search traffic of a website is pretty straightforward, there are opportunities for firms to harness those traffic sources of other websites, since harnessing their own to their web rank and profit favour. Crowdsourcing and crowdfunding websites could be possible websites of interest for a firm to exploit their referral and search traffic.

### 1.2.2. Web Traffic and Keyword Usage Explanation through a Business Brand Name

Van Loenen [13] argues that “open data strategies should be related to any one of the greater open data targets of increasing transparency, accountability and enhancement of effectiveness and profitability of business operations”. Data coming from crowdsourcing platforms comprise great advantages and benefits for businesses that exploit them, such as precise decision-making, website insights, scalable and mobile measures etc. [38]. Moreover, the more a business understands and gains from its web global ranking, the more chances it has to improve its site and attract more traffic to it [39]. With the benefits from crowdsourcing big data utilisation multiplying, the need for businesses to fully understand and analyse data from websites is higher than before due to their magnitude in grasping various business indexes.

In alignment with the above, as McCarthy [40] reported, social traffic generates a tiny amount of a firm’s profit annually and has a small part of total traffic share. This finding suggests that businesses still keep on investing social media traffic attraction, despite not being able to increase the social traffic of their website through revenue and profit raising. When it comes to revenue relationships with keywords, the analysis follows the same path. A rise in revenues invested in keyword selection leads to a more specified and total amount of keywords, in an effort to maximise firm’s profitability, while reduced revenues for keyword analysis has led to less specified and total keywords [41]. From the above background, we discern the relationship between firm’s profit and web rank with its social traffic and keyword analysis, aiming to expand the knowledge on cause-and-effect relationships, with practical insights for digital marketing strategies based on social traffic, and top 3 and total keyword benefits.

### 1.2.3. Key Performance Indicators of Traffic and Keywords Volume for Businesses and SEM

People are searching for various topics, ordering goods, surfing through the web etc. daily, meaning that search engines lead to the majority of web traffic. Website visitors are driven there via keyword search. When typing specific keywords, search engines based on their unique algorithms determine the website’s place on potential visitors search results. Users are directed to the corresponding website by clicking a listing in their search results; thus, with the data transferred to the website’s server, adding to the rise of overall traffic flow of a website by counting these visitors. A performance indicator or key performance indicator (KPI) is a type of performance measurement [42] that evaluates a businesses’ success in certain activities that it takes over.

The entire process of harvesting search engines in favour of digital marketing is called Search Engine Marketing (SEM). SEM utilises visitor keywords and sources of traffic (web analytics) in order to assess the profitability of the digital marketing campaign and measure the performance and effectiveness of applied digital marketing techniques [43]. However, the plethora of digital marketing campaigns and the lack of understanding web metrics makes it more difficult for KPIs to meet necessary criteria [44] and for marketers to appropriately align metrics with the ideal for the organisation KPIs [43]. Through this paper, we distinguish the roles of referral and search traffic, gross profit, social traffic, and top 3 and total keywords volume per month.

If a business crowdsources its activities, instead of accomplishing them internally, it wants to measure and align the results to its web metrics. Therefore, knowing that the number of specific sources of traffic affects their traffic or keywords, businesses can relate them to their digital marketing strategy. In the next stage, businesses can also relate this varied website social traffic or keyword volumes to their web ranking and profit, to gain insights about their SEM strategy. For the purposes of this paper, we suggest and examine the KPIs included in Table 1. The capitalisation of the below KPIs should be compared to each other every month for a more accurate depiction of a firm’s performance.

**Table 1.** Reference of paper suggested KPIs and Performance Measurements.

KPIs	Performance Measurement
Crowdsourcing Referral & Search Traffic/month	It is valuable for a firm to observe the traffic of crowdsourcing platforms, as our study indicates. More specifically, we suggest the monthly measurement of their referral and search traffic for comparison between them and analysis over which is underperforming [45]. This leads to extensive knowledge about which crowdsourcing traffic source gives more accurate data over a month period.
Gross Profit/month	Measuring the performance of gross profit provides firms with important data concerning expenses and earnings, as well as resource channelling and business strategy planning [46].
Global Web Ranking/month	A global ranking system rates dozens of websites in popularity, estimating the approximate daily average unique visitor and the number of page views of the site over the last month [39]. The lower the rank, the more famous the website is.
Social Traffic/month	The examination of a firm's social traffic throughout a month period, can give information about a firm's campaign effectiveness and visitors awareness and engagement [45], making it a useful performance measurement indicator.
Top 3 and Total Keywords/month	Firms can track and measure the volume of ranked keywords that lead visitors to their site and examine the growth of these metrics [47], per month setting customised performance measurements.

### 1.3. Problem Formulation and Research Hypotheses

Being on the very edge of competitiveness, a big company needs to know exactly what factors affect their image and financial brand name. Brand name, connected with a company's financial results, can be influenced by many economic factors, such as gross profit, share stock price, and air tons transferred, while also including the digital marketing factors such as web ranking etc. It is quite logical for air forwarding companies to seek ways of improving their effectiveness and efficiency, most of the time utilising pioneer technologies and methods. Usage of crowdsourcing platforms for completion of company tasks and activities has widely been utilised in recent years, with no exception to the air forwarding sector. Since the air forwarding sector uses these platforms, it is important to know whether the more they visit crowdsourcing platforms for outsourcing activities the better or worse it is for their brand name; in this paper we study the gross profit and global web ranking as brand name variables. Furthermore, after understanding the impact of a crowdsourcing platform's big data on their web metrics, air forwarding companies should examine the variation of their global rank and gross profit on their webpages, which are affected most by their web metrics.

More thoroughly, our first purpose is to detect whether crowdsourcing referral traffic impacts air forwarders' social traffic, and up to which point their global web rank and gross profit are affected (Hypothesis 1). After setting the first research hypothesis, we continue with crowdsourcing referral traffic's indirect impact to air forwarders' gross profit and global rank, while having affected first their top 3 and total keywords volume (Hypotheses 2 and 3). Having examined the repercussions of crowdsourcing referral traffic, we turn to crowdsourcing search traffic. Staying on the same route, we want to estimate its effect on air forwarders' social traffic and the later impact of social traffic variation on their gross profit and global rank (Hypothesis 4). For the last two hypotheses, we seek again to estimate the indirect impact of crowdsourcing search traffic on air forwarders' gross profit and web ranking, after directly having affected their top 3 and total keywords (Hypotheses 5 and 6), measuring keyword volume variation effect on them (profit, rank). The results of the data collected from the crowdsourcing platforms and the air forwarding companies' website activity give valuable feedback including:

- To business strategists to easily understand the various web metrics of crowdsourcing platforms affecting their financial results after having crowdsourced their activities.

- To marketers and web developers to have a clear image of their website's metrics highly affecting gross profit and web ranking, trying to comprehend them in order to maximise profit and web positioning.
- To the whole organization so as to organise properly a top-end digital marketing strategy, especially for SEM, based on the impact their web metrics have on the organisation's financial results, while collecting data by crowdsourcing their activities. In this way, they will be able to leverage crowdsourcing web metrics, such as traffic or keywords usage, in favour of their brand name and optimise their own web metrics to boost their financial results such as profit, share prices etc., or digital marketing performance such as global web ranking.

Therefore, we settle on six research hypotheses, aiming to extend the practical knowledge over the impact of crowdsourcing platforms' big data to air forwarding sector's gross profit and global rank, after having affected first positively or negatively their website big data:

**Hypothesis 1 (H1).** *Referral Traffic of Crowdsourcing platforms impacts on Air Forwarders' Global Rank and Gross Profit through Social Traffic.*

**Hypothesis 2 (H2).** *Referral Traffic of Crowdsourcing platforms impacts on Air Forwarders' Global Rank and Gross Profit through Top 3 Keywords.*

**Hypothesis 3 (H3).** *Referral Traffic of Crowdsourcing platforms impacts on Air Forwarders' Global Rank and Gross Profit through Total Keywords.*

**Hypothesis 4 (H4).** *Search Traffic of Crowdsourcing platforms impacts on Air Forwarders' Global Rank and Gross Profit through Social Traffic.*

**Hypothesis 5 (H5).** *Search Traffic of Crowdsourcing platforms impacts on Air Forwarders' Global Rank and Gross Profit Top 3 Keywords.*

**Hypothesis 6 (H6).** *Search Traffic of Crowdsourcing platforms impacts on Air Forwarders' Global Rank and Gross Profit through Total Keywords.*

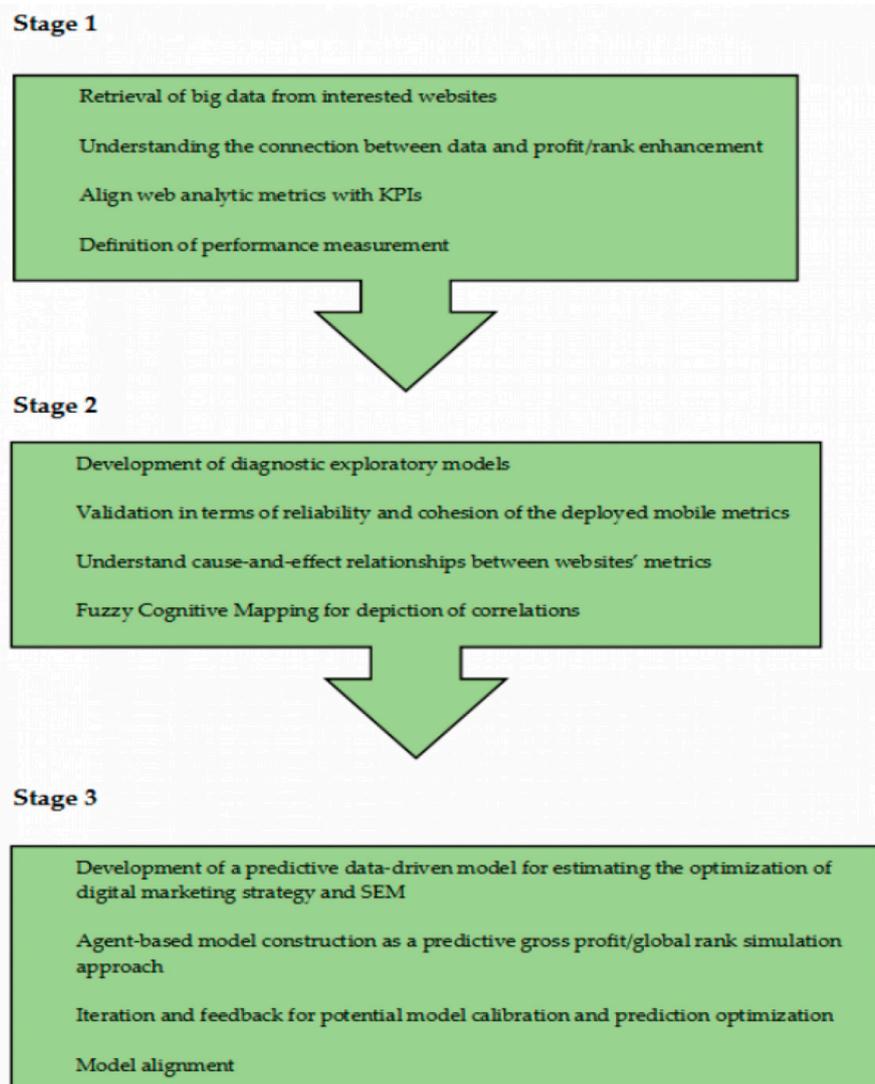
## 2. Materials and Methods

During the course of this paper, we propose an innovative methodology in order to achieve a different strategic perspective for understanding a company's financial brand name through its web metrics, such as web traffic types and keyword usage, at the same time that the company outsources its activities at crowdsourcing platforms. So as to elaborate this framework, we integrate these three staged research procedures (Figure 1).

1. Big data retrieval from crowdsourcing platforms and air forwarding companies' websites through web analytics tools (SEMrush), for exploring and discovering connections between them, while aligning them with KPIs. From the gathered data, we discern the roles of crowdsourcing companies' referrals and search traffic and air forwarders' social traffic and top 3 and total keywords linked to their websites.
2. Diagnostic exploratory model deployment, estimating the existing strong relationships, either positive or negative, between the web analytics metrics, based on integrity, veracity and credibility, by applying Fuzzy Cognitive Mapping [47], linear regression and correlation analyses.
3. Lastly, predictive and simulation model deployment (Agent-Based Modelling) combined with regression analysis results, with the purpose of estimating the span in which the air forwarding sector's social traffic, top 3 most common and the total number of keywords linked to the five chosen websites are affected by crowdsourcing platform referral and social traffic, only when both air forwarding and crowdsourcing website analytics impact the air forwarding sector's gross profit and web rankings.

Many topics of digital marketing strategy, mainly implemented on websites, are reflected in our approach, especially Search Engine Marketing. In the first stage, we intend to provide helpful insights to managers dealing with big data from web pages. Collecting

specific web metrics that are conforming with the chosen KPIs, as well as depicting an initial tableau of crowdsourcing activities' performance, are part of the proposed process (e.g., noticing high variation in a website's top 3 keywords attracting visitors, as one of the main KPIs could indicate an increase in company's global web rank or gross profit caused by a high number of crowdsourcing platforms' referral traffic).



**Figure 1.** Overall representation of the proposed methodology reflecting the stages for utilising data from crowdsourcing platforms in favour of the air forwarding sector's gross profit and global rank.

At the second stage, digital marketing strategists are in a position to have a clear view of the parameters and the means with which they impact the organisation's web metrics, such as types of crowdsourcing platforms traffic, and how those varying metrics (traffic and keywords volume) impact the organisation's web ranking and gross profit. This can be achieved through statistical and quantified analysis, where a variation (decrease or increase) of specific types of web traffic, such as social traffic, top 3 keywords volume and total keywords volume, caused by high referral or search traffic of crowdsourcing platforms, affects a firm's global rank and gross profit. Furthermore, having checked the intercorrelations among the chosen metrics from both kinds of websites and air forwarding sector's gross profit, we run regression models for the interested variables, opening way for a more accurate and reinforced decision-making process for digital marketing strategists or managers for better planning of their SEM.

At the third stage, the above relationships and statistical regression outputs of the metrics in the development of the predictive and simulation models for accurate metrics prediction were placed. This stage is rooted in data-driven decision-making, making it stronger and more valid with the predictive and simulation model development reaching out to both micro and macro level angles [48]. Finally, we try to connect the results of the proposed model with the way random users interact with both air forwarding and crowdsourcing companies' websites. For this purpose, an eye tracking application is used and the total activity tracked will give important feedback linked to our model.

### 2.1. Sample Selection, Data Retrieval and KPIs Alignment

Retrieval of website data was implemented through a compilation of some of the most known companies in the sector of air forwarding and crowdsourcing platforms. We summoned the top five air forwarding companies of 2019, based on most air metric tons transferred in 2019 [49]. The included air forwarding companies were DHL, Kuehne & Nagel, DB Schenker, DSV Panalpina and UPS, while the five used crowdsourcing platforms were Amazon MTurk, Microworkers, Patreon, Indiegogo and Upwork. We gathered data from their websites including crowdsourcing platforms' referral and search traffic and air forwarding companies' social traffic, top 3 keywords and total keywords volume, including their gross profit and global rank variation for cause-and-effect relationship tests with the rest of the metrics. The websites of the referred companies and platforms consist of an exorbitant number of information and other dynamic material, creating a very promising environment for exploring referral, search and social traffic, as well as top 3 and total keywords volume.

For research purposes, we gathered data from the ten selected websites daily, for the purpose of better comprehending the variance of the chosen web metrics. The testing period was 210 days of observation, and each day the data led to our metrics in multiple numerical results, differing from day to day. The fact that different visitors with dissimilar behaviours and reasons ended up in those websites means that there is a big fluctuation in the metrics (air forwarding social traffic, and top 3 and total keywords volume), gathering an insurmountable amount of data for analysis in the 210 observation days. Moreover, aligning with the needs of air forwarding businesses' marketing strategists to ease KPI calculation issues, we suggested the tracking of social traffic percentage of total traffic, and top 3 and total keywords volume (top 3 as percentage of total keywords), in this exact sequence, as a way to better handle and understand big data form website in favour of their digital marketing optimisation. The web metrics used in this paper are presented in the table below (Table 2).

**Table 2.** Description of the examined web metrics.

Web Analytics Metrics	Description of the WA Metrics
Referral Traffic	Referral traffic is a way of reporting when someone visits a site, who either came from some other website or a web page. This involves blogs, directories, industry related forums etc. When sites of these types or other pages on the web make a link to another site, sending traffic to that site, it is called referral traffic [45].
Search Traffic	Search traffic is when a website's visitor inserts a search term into a search engine right before ending up on that website. Organic search results are a sum of links to websites, based on how relevant the search terms are, without including ads [50].
Social Traffic	Social traffic refers to traffic coming to a website, mobile site or mobile application from social networks and social media platforms [45].
Total Keywords	A keyword is the phrase or word that people who want to visit a website enter into search engines to find that specific content [51]. Therefore, total keywords are the total amount of phrases or words that lead visitors to a website through queries in search engines.
Top 3 Keywords	When we refer to top 3 keywords, we point out the existence of three words that are common among visitors' keywords that are put in search engines and lead them to a specific website. Thus, knowing these most common keywords helps companies significantly to optimise their digital marketing strategy [52].

## 2.2. Diagnostic Exploratory Model Development

In this stage of the paper, we make efficient use of the web analytics data from the gathered sites in order to develop a model which will:

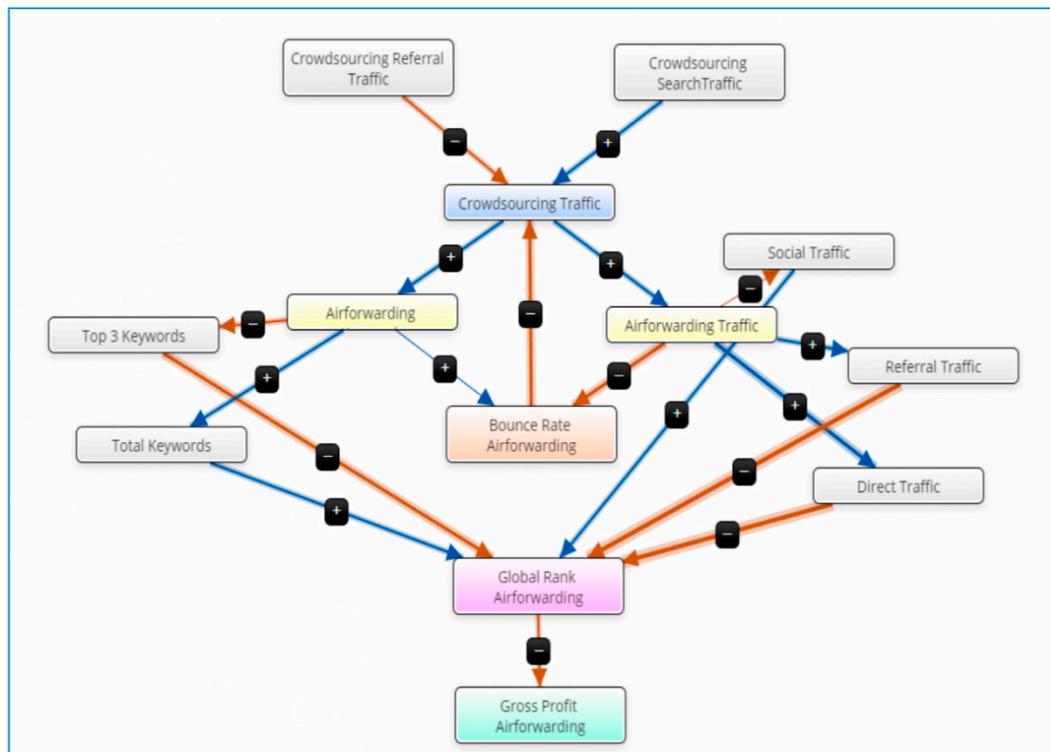
- emphasise the strong positive or negative relationships of the selected metrics,
- comprise the much-needed veracity and credibility, so as to enable potential model implementation from businesses' marketing strategies.

During the first stage, we applied statistical analysis to examine the normality and linearity of selected datasets from the ten chosen websites. The analysis included the whole dataset for the 210 days of observation, ensuring normality and linearity. Later on, we performed the Cronbach alpha [53] and Kaiser–Meyer–Olkin [54] tests on different groups of variables such as gross profit, global rank, social traffic etc. (Table 2) to ensure cohesion and tolerance of combined variables, in case this is possible. Lastly, linear regression modelling was performed on selected data that appear to have strong connections between them, for development of a diagnostic exploratory model, presenting the above connections of the web metrics.

From the regression analysis, the outcome that emerges shows contrary effects of the two types of crowdsourcing traffic (referral and search) on air forwarders' social traffic, and top 3 and total keywords volume. Namely, three out of five air forwarding companies' social traffic is affected positively by crowdsourcing search traffic and negatively by their referral traffic. We also found that three out of five air forwarders' gross profit and global rank are affected by their website social traffic, which are also affected at a rate two out of five firms by top 3 keywords volume and, at one out of five, by total keywords volume. From the above, we aim to give additional knowledge to business strategists on the impact of crowdsourcing traffic on the firm's web traffic/keywords volume and to marketers over the possible utilisation of the latter impacts of social traffic, and top 3 keywords and total keywords volume on gross profit and web ranking, in favour of their digital marketing strategy (SEM).

Therefore, we developed a Fuzzy Cognitive Mapping (FCM) involving all web metrics of both crowdsourcing and air forwarders platforms depicting the whole cause-and-effect relationships, so as to obtain a more tractable model for examination and assessment. Fuzzy Cognitive Map development makes up a basic descriptive and consolidated stochastic classification method, used to portray the correlations between web metrics of Air Forwarding and Crowdsourcing companies. Blue and red connections can be seen in the figure, which means that variables have positive and negative relations between them. The FCM has been developed via the Mental Modeler cloud-based application.

The Fuzzy Cognitive Map is used to illustrate the existing agents' relationships; in our paper, we use it to recognise the important relationships between factors with the use of arithmetic clouds. Exploratory modelling has been widely applied in decision making in R&D and marketing strategy describing the relationships among elements, proving to be very useful [55]. By applying FCM, a firm can deploy a macro-level approach of their digital marketing strategy, based on the cause-and-effect relationship between the chosen factors [56]. Furthermore, Fuzzy Grey Cognitive Maps, an extension of FCM, offers practical solutions for modelling unpredictable, limited and fragmented data [57], which could help analogous problems. In Figure 2, we can clearly see the plethora of subfactors existing in our macro-level analysis, from whom we only focus on five of them and the interaction among them and with gross profit or global rank. Doing so, we provide the necessary tools for digital marketing optimisation, as we present the whole macro-level image of a possible marketing strategy (e.g., SEM). This means we provide means for reviewing the impact of crowdsourcers' traffic to air forwarders' traffic/keywords, while boosting or reducing their gross profit/global rank, as part of a firm's digital marketing strategy.



**Figure 2.** Fuzzy Cognitive Mapping depiction of a macro-level approach.

Apart from FCM, which gives the macro-level approach of the case a firm deals with, in order to have a complete picture of the situation, a micro-level analysis is needed. This is a kind of analysis provided by the implementation of Agent-Based Modelling (ABM). ABM depicts the atomic dynamic variations amongst selected factors, hence generating efficient predictive and simulation models [48]. For example, there are different types of crowdsourcing traffic affecting other firm's web traffic/keywords, affecting afterwards the firm's global rank and profit. Through ABM, we can calculate the effect of specific types of crowdsourcing traffic to specified kinds of traffic/keywords and the level of its impact on a firm's web rank and gross profit. In accordance, deployment of predictive and simulation models is essential, with the examined date to be set up to 210 days of observation for our experiment.

### 2.3. Predictive and Simulation Model Development

Proposed models of agent-based concepts include a set of agents with different characteristics, interacting among them through various operators, leading to a proper portrayal of the designed system and the units it contains. With the rise in utilisation of big data, the characteristics of agent-based modelling (ABM) made them an essential tool for prediction and simulation model development in a plethora of topics. The step before managerial decision making can become much easier with the application of ABM. In this respect, digital marketing strategies such as SEM can be extremely benefited and improved by the implementation of website traffic and keyword analytics, and financial brand name's factors combination. ABM forms a refined computational and heuristic process, exploiting big data in large scale, marketers' or strategists' domain knowledge and relationships between factors. In this way, ABM offers micro-modelling depiction of real problems and decision-making formulations [58], while providing additional benefits to marketing executives as:

- It exploits a full range of data created by crowdsourcing platforms the firm collaborates with, and the types of crowdsourcing traffic mostly affecting their traffic and keywords volumes. From that point, they will be able to have a clear image of possible ways

to harness crowdsourcing traffic data in favour of their digital marketing strategy and SEM.

- It acquires knowledge over visitor's micro-level modelling for better simulation, at no cost. The firm's traffic sources and keyword volumes affect consequently the website's ranking and firm's gross profit. Therefore, the level of crowdsourcing platform's traffic types directly affects another firm's web traffic/keywords and, through it, indirectly their web rank and gross profit. This gives plenty of insights concerning crowdsourcing visitors and firm's website visits. Visitors coming from specific types of crowdsourcing traffic explain an important piece of a firm's specific types of traffic/keywords, which then impacts their global web rank and gross profit variability.
- It streamlines the deployment of the model prediction after making it more versatile and providing it with additional tools for growth continuance. In accordance with the above, we assembled Agent Based Modelling (ABM), which offers a plethora of attributes for predictive simulation. Its dynamic character suits the vigorous digital marketing sector, making it capable of computing and depicting the varying web metrics.

### 3. Results

In this chapter, results, generated from the chosen statistical approach, are presented after being collected from the selected platforms' websites. Table 3 depicts the chosen descriptive statistics such as mean, min, max and standard deviation for each of the involved web metrics.

**Table 3.** Descriptive Statistics about the total gross profit, global rank, traffic and keyword types for the chosen air forwarding and crowdsourcing companies' websites, during a six-month period.

	Mean	Min	Max	SD
Total Traffic Crowdsourcing	157,492,373.1	148,654,999	165,591,733	5,671,600
Referral Traffic Crowdsourcing	240,172,187.5	22,306,346	26,353,944	1,709,633.9
Search Traffic Crowdsourcing	24,986,409.7	20,559,872	32,313,788	4,189,348
Gross Profit (Kuehne Nagel + DSV + UPS)	18,356	12,895.9	30,305	5664.5
Gross Profit (Kuehne Nagel + UPS)	4918.6	3576	6551	931
Gross Profit (DHL + DB Schenker)	690.7	−1308.6	1461.6	764.6
Social Traffic (Kuehne Nagel + DSV + UPS)	1,599,024.5	1,465,838	1,653,731	75,116.5
Top 3 Keywords (Kuehne Nagel + UPS)	110,608.5	101,005	123,990	8991.9
Total Keywords (DSV)	119,085.2	110,469	125,366	6268.6
Global Rank Air Forwarding	35,042.2	31,322	38,273	2512.8
Bounce Rate Air Forwarding	0.366	0.29	0.46	0.072
Bounce Rate Crowdsourcing	0.312	0.31	0.32	0.00634

N = 210 observation days for 5 air forwarding websites and 5 crowdsourcing websites.

As can be seen in Table 4, the items consisting each of the processed variables, either specific companies' gross profit or website traffic/keywords, give close to the required levels of tolerance and item coherence in the results. With KMO and Cronbach's alpha values higher than 0.7 [53,54] the items are tolerant, coherent and proper for statistical analysis. The fact that some items score below 0.7 is not a concern, because their combination occurred for the regression analysis part.

**Table 4.** Consistency of combined variables used in regression analysis.

	Cronbach's Alpha	Kaiser-Meyer-Olkin Factor Adequacy	% of Total Variance Explained
Gross Profit (Kuehne Nagel + DSV + UPS)	0.752	0.775	96.012
Gross Profit (Kuehne Nagel + UPS)	0.751	0.500	97.631
Gross Profit (DHL + DB Schenker)	0.750	0.500	51.671
Social Traffic (Kuehne Nagel + DSV + UPS)	0.428	0.768	95.461
Top 3 Keywords (Kuehne Nagel + UPS)	0.732	0.500	96.776

In Table 5, we see the results that came from the multiple linear regressions we performed for the crowdsourcing and air forwarders' websites. Table 5 shows that almost all regression models are statistically significant, with  $p$  values below 5%, verifying the first part of all the research hypotheses. Three out of five air forwarders' web metrics are significantly affected by crowdsourcing website referral and search traffic. The significant regression equations reveal that every 1% increase of crowdsourcing referral traffic causes a decrease of 3.6% in air forwarders' social traffic and 1% in total keywords volume, while increasing by 0.5% air forwarders' top 3 keywords volume. On the other hand, an increase of crowdsourcing search traffic by 1% leads to an increase in air forwarders' social traffic and total keywords by 1.3% and 0.5% respectively, while decreasing top 3 keywords by 0.2%. All of the referred regressions have  $p$  levels below 5%, except one occasion below 10%, with  $R^2$  results above 0.56 underlining the regression significance.

**Table 5.** Impact of crowdsourcing web metrics in three out of five air forwarders' web metrics.

Variable	Coefficient	R <sup>2</sup>	F	p-Value
Constant (Social Traffic Air Forwarders)	2,466,738	0.673	8.235 *	0.045
Referral Traffic	−0.036			
Constant (Top 3 Keywords Air Forwarders)	−8661.7	0.887	31.535 **	0.005
Referral Traffic	0.005			
Constant (Total Keywords Air Forwarders)	401,167.5	0.745	11.691 *	0.027
Referral Traffic	−0.010			
Constant (Social Traffic Air Forwarders)	1,262,970	0.563	5.146	0.086
Search Traffic	0.013			
Constant (Top 3 Keywords Air Forwarders)	157,455.8	0.763	12.881 *	0.023
Search Traffic	−0.002			
Constant (Total Keywords Air Forwarders)	50,459.6	0.967	115.607 **	0.000
Search Traffic	0.005			

\* and \*\* indicate statistical significance at the 95% and 99% levels respectively.

Heading to Table 6, we analyse the impact of air forwarders' selected web metrics to their global ranking. The significant regression that occurs reveals  $p$  levels of 0.000 and  $R^2$  of 1. For every 1% of increase in social traffic, top 3 keywords and total keywords, air forwarders' global rank increases by 4.3%, 309.9% and 92.5% accordingly. In this way, the second of the third stages needed for the six research hypotheses is completed and verified, moving to the third one for the total hypotheses' validation.

**Table 6.** Impact of air forwarders web metrics in their global ranking.

Variable	Coefficient	R <sup>2</sup>	F	p-Value
Constant (Global Ranking Air Forwarders)	−464,576.4	1	- **	0.000 **
Social Traffic	0.043			0.000 **
Top 3 Keywords	3.099			0.000 **
Total Keywords	0.925			0.000 **
Referral Traffic	−0.002			0.000 **
Direct Traffic	0.010			0.000 **

\* and \*\* indicate statistical significance at the 95% and 99% levels respectively.

Next, in Table 7, we see another statistically significant regression model with  $p = 0.028$ ,  $R^2$  of 0.741 and potential variation of −0.064 (−6.4%) for three out of five air forwarders' websites. For every 1% increase of social traffic, the social traffic is decreased by 6.4. In this way, the first and second hypotheses are verified, as social traffic has statistically significant regressions with referral, search traffic, global rank and gross profit, respectively. In Table 8, two out of five air forwarders' websites have statistically significant regressions with  $p = 0.000$ ,  $R^2 = 0.981$  and potential variation of 0.092 (9.2%). If top 3 keywords' volume is increased by one percent, gross profit will be increased by 9.2. Therefore, the third and fourth hypotheses are also verified with deployment of statistically significant

regressions for top 3 keywords volume with referral, search traffic, global rank and gross profit, accordingly. At last, in Table 9, we obtain a statistically significant regression model for one out of five air forwarders' websites with  $p = 0.024$ ,  $R^2 = 0.758$  and potential variation of  $-0.217$  ( $-21.7\%$ ). Every 1% increase in total keyword volume leads to a decrease in gross profit of 0.217. At this point, hypotheses five and six are verified with the statistical significance of total keywords with referral, search traffic, global rank and gross profit.

**Table 7.** Impact of air forwarders' social traffic in three out of five air forwarders' gross profit with social traffic related to crowdsourcing websites referral/search traffic.

Variable	Coefficient	R <sup>2</sup>	F	p-Value
Constant (Gross Profit Air Forwarders)	124,369.45	0.741	11.453	0.028 *
Social Traffic	-0.064			

\* and \*\* indicate statistical significance at the 95% and 99% levels respectively.

**Table 8.** Impact of air forwarders' top 3 keywords in two out of five air forwarders' gross profit with keywords related to crowdsourcing websites referral/search traffic.

Variable	Coefficient	R <sup>2</sup>	F	p Value
Constant (Gross Profit Air Forwarders)	-4741.756	0.981	212.139	0.000 **
Top 3 Keywords	0.092			

\* and \*\* indicate statistical significance at the 95% and 99% levels respectively.

**Table 9.** Impact of air forwarders' total keywords in one out of five air forwarders' gross profit with keywords related to crowdsourcing websites referral/search traffic.

Variable	Coefficient	R <sup>2</sup>	F	p Value
Constant (Gross Profit Air Forwarders)	51,657.636	0.758	12.525	0.024 *
Total Keywords	-0.217			

\* and \*\* indicate statistical significance at the 95% and 99% levels respectively.

These results indicate that crowdsourcing platforms with high referral traffic tend to reduce air forwarding companies' social traffic and total keywords volume, and increase the top 3 keywords volume, while their search traffic leads to the exact opposite results of the same variables. These variations in air forwarding companies' social traffic and keywords affect their global rank by increasing firms' global ranking. The variations of social traffic and total keywords volume decreases air forwarders' gross profit, with top 3 keyword density increasing it. Therefore, the higher the social traffic is, the higher the global rank and the lower the gross profit; the higher the top 3 keyword volume is, the higher the global rank and the gross profit; lastly, the higher the total keyword volume, is the higher the global rank and the lower the firms' gross profit. There is great opportunity to exploit crowdsourcing platforms' traffic in favour of air forwarders' ranking, profit and web traffic.

#### Agent-Based Model Development

The regression analysis, as referred to previously, led to significant outcomes that are being used by the ABM for development of a simulation and predictive model, by exploiting those statistics (from regression). Regression results help gather information about agents' behaviour, and through ABM we are able to comprehend how to refine digital marketing strategies based on event occurring probabilities and variable cause-and-effect relationships. Relying on Davis et al.'s [59] framework, we created an Agent-Based Model counting on data-driven movement and decision paths. Hence, a plethora of advantages emanate from ABM implementation in digital marketing, such as prediction of web traffic/keywords rate and volume, with multiple applications in firm profitability and webpage visitation prediction.

Type of data: reports to quantitative data retrieved from regression and statistical analysis and are inserted to the AMB. This type of data is depicted by numbers, revealing the relationships between variables necessary for model development.

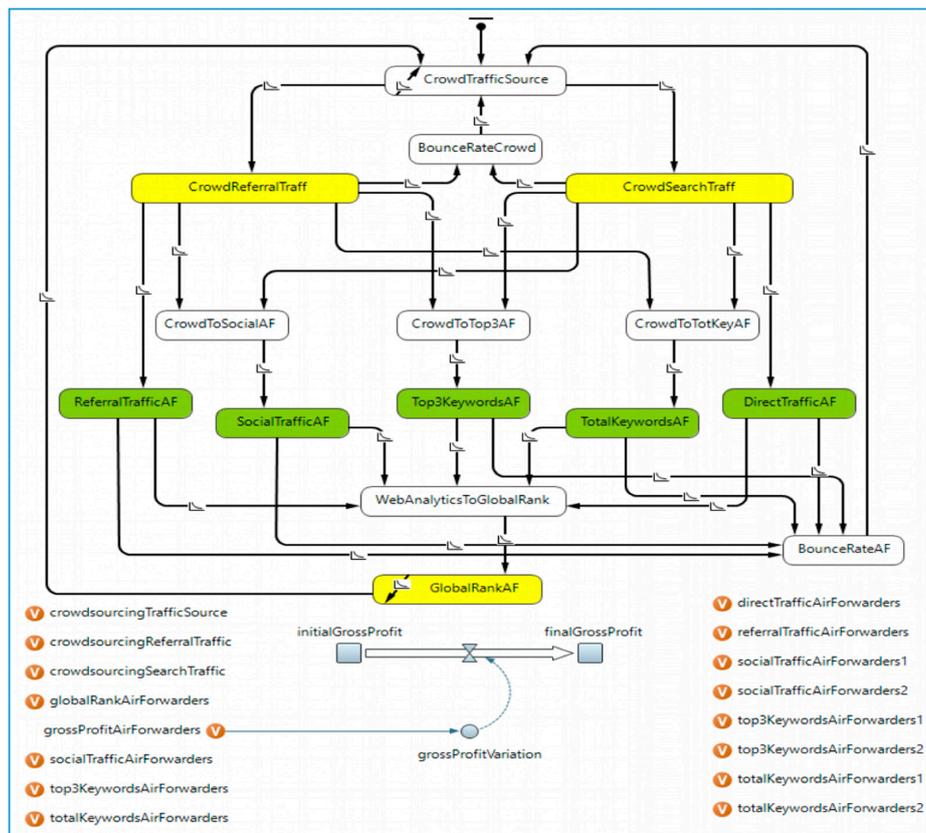
Data measurement repetition: for analysis purposes, we used the one-time snapshot dataset process to retrieve data concerning a specified date range. Thus, we provided the ABM with real-time data regarding the selected web metrics, something that is proven to be highly important for firm's digital marketing strategy development.

Agents' involvement: in the last stage, we analysed the steps of implementing and estimating the data to the Agent-Based Model. Having applied the results of FCM as part of our macro-level modelling, we continued applying the regression statistics to every agent individually. This way, we refer to individual levels of ABM, while also introducing the Poisson probability distribution with lambda values ( $\lambda$ ) around possible mean values of organic crowdsourcing traffic connected to Crowdsourcing Referral and Search Traffic. There are plural causes driving us to the usage of the Poisson probability function [60] in our research, such as:

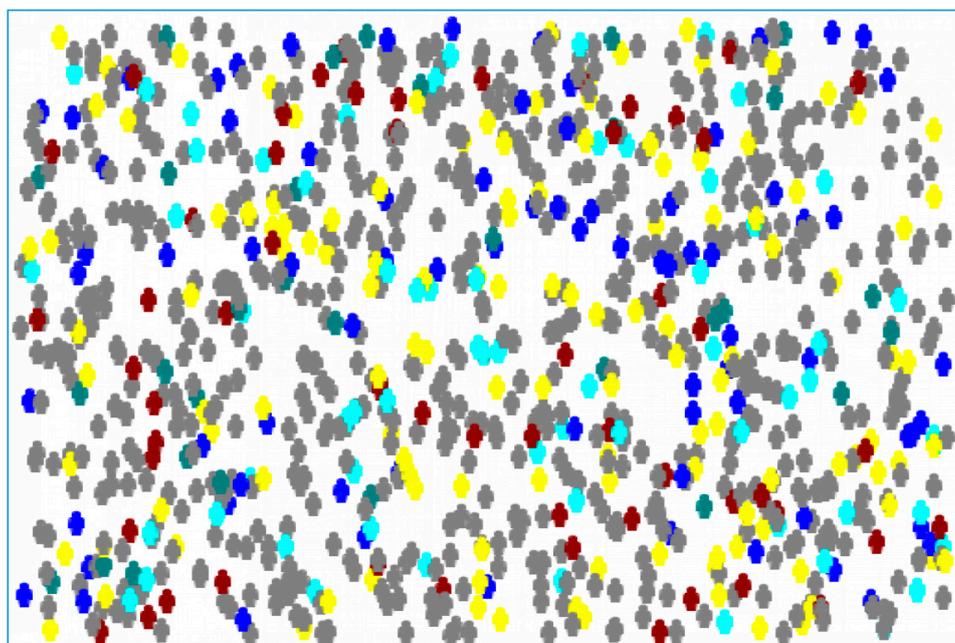
1. determining more accurately the time window for executing the predictive model under optimisation (in our research we use 210 observation days).
2. It can be expressed by the constant descriptive statistics of the five crowdsourcing websites during the 210 days of data collection.
3. defining the singularity of performance in global rank, gross profit, social traffic, and top 3 and total keywords of the selected websites, without being affected by historical stats and data of other websites.

In Figure 3, the Agent-Based Model is introduced, aiming to give practical and plain knowledge of the impact of crowdsourcing web traffic to a firm's web traffic/keywords and the later impact on their gross profit. These insights help marketers and strategists to optimise their firm's digital marketing strategy and SEM. From the calculative ABM deployment, we can observe the JAVA coding outputs in Table A1 (see Appendix A).

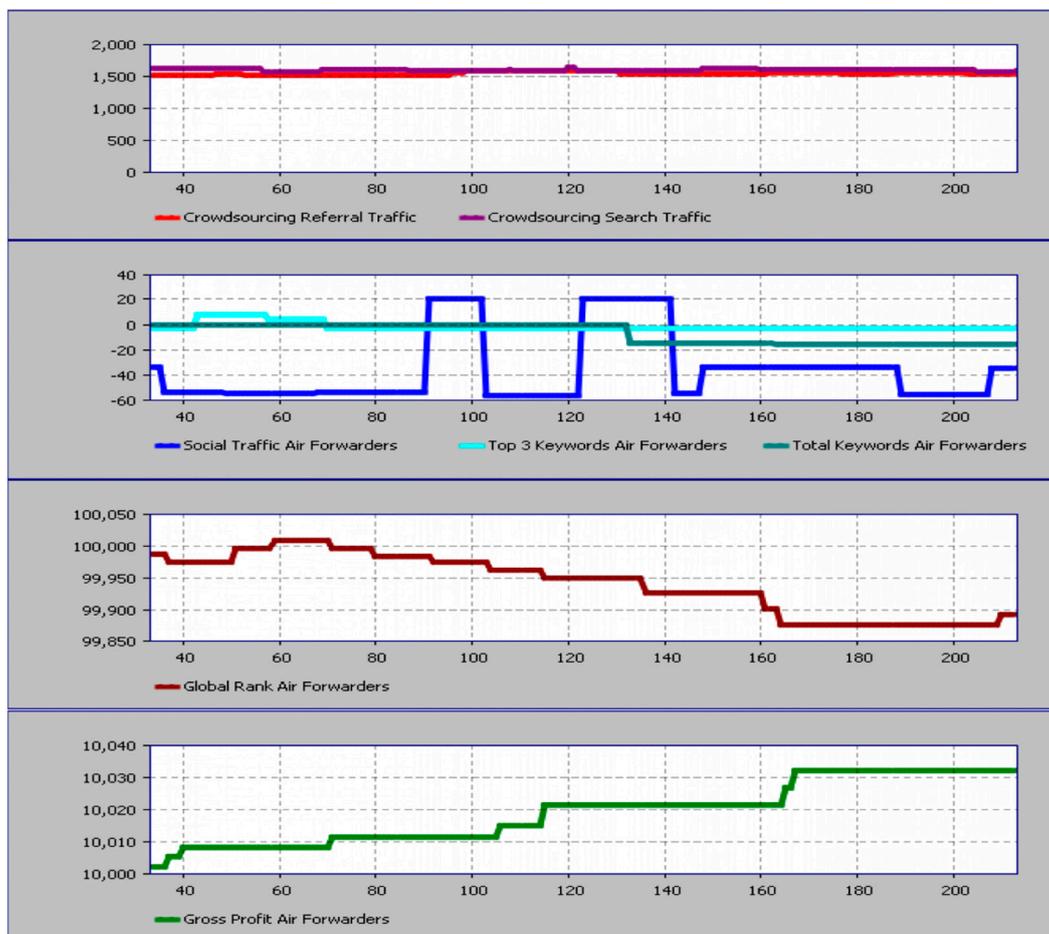
The model's start is the Crowdsourcing Traffic Source, which follows the Poisson distribution and splits into Crowdsourcing Referral Traffic and Crowdsourcing Search Traffic in the first state charts, beginning the Agent-Based Modelling creation process. With a probability of 60%, variation in Crowdsourcing Referral Traffic decreases air forwarders' social traffic (Social Traffic Air Forwarders), Total Keywords (Total Keywords Air Forwarders) and in-creases Top 3 Keyword volumes (Top Three3 Keywords Air Forwarders), while variation in Crowdsourcing Search Traffic leads to the exact opposite results with different magnitudes. That alteration in air forwarders' social traffic and keywords, caused by crowdsourcing referral and search traffic, tends to impact firms' Global Ranking, leading to its increase; meanwhile, their gross profit (Gross Profit Air Forwarders) is boosted by Top 3 Keywords Air Forwarders and degraded by Social Traffic Air Forwarders and Total Keywords Air Forwarders. These are the web metrics involved in our paper, and the probabilities that do not lead to air forwarders' gross profit influence do not affect any other of the model's variables will not be taken into account. In this model simulation, we represent the path that drives to the provoked change in air forwarders' global ranking and gross profit by crowdsourcing referral traffic and search traffic, through affecting social traffic, and top 3 keywords and total keywords. The outcome of the ABM procedure generates an agent population allocation (Figure 4) and a time-graph (Figure 5) that displays the increase and decrease in air forwarders' global web ranking and gross profit, due to change in their social traffic, and top 3 and total keywords, caused by high varying amounts of referral and search traffic ending up in crowdsourcing platforms.



**Figure 3.** Agent-based predictive model development for the potential prediction and optimisation of Air Forwarding companies’ gross profit and brand name through Search Engine Optimisation by focusing on website traffic and keyword linkage.



**Figure 4.** Population allocation in an experiment with 1000 agents. The grey colour represents crowdsourcing general traffic, yellow the analogy of referral and search crowdsourcing traffic, blue air forwarding sector’s social traffic with cyan as the top 3 keywords and teal as the sector’s total keywords. The latter maroon colour represents the analogy of the affected air forwarders’ global web rank.



**Figure 5.** Depiction of Air Forwarding companies' social traffic, and top 3 and total keywords distribution with Crowdsourcing platforms' search traffic following the Poisson distribution, connected to higher Air Forwarding Companies' gross profit.

In Figure 4, we see the dispersion of 1000 agents in a period of 210 observation days. This involved crowd referral and search traffic, and air forwarders' three web analytics as well as their global web ranking. Beginning with 1000 possible visitors of crowdsourcing websites (grey), we saw how traffic disperses to referral and search traffic (yellow), and how it connects with air forwarders' social traffic (blue) and top three and total keyword (cyan) volume (teal), ending to potential connection to their global web ranking (maroon). Now, we have a clear picture of the diaspora of potential crowdsourcing platform visitors, and the rate at which they affect air forwarders' social traffic, and top3 and total keywords volume, and global ranking.

The vertical axis indicates the outcomes, as dollars (gross profit), number of web rank, visitors and keywords leading to a company's website, and the horizontal axis indicates the date range that the simulation takes place, that is 210 sequential days for the combination of the five plus five examined companies' websites (five for air forwarding sector and five for crowdsourcing platforms). It becomes obvious that high crowdsourcing platforms' referral traffic increases air forwarders' website top 3 keywords volume, while decreasing total keywords and social traffic, leading to a higher global web rank and higher gross profit. The opposite happens when crowdsourcing platforms' search traffic is high, decreasing air forwarders' top 3 keywords while increasing their total keywords and social traffic, leading to a lower global rank and gross profit. This mass data production happens on a daily basis, and the high correlation among selected variables shows a strong connection between air forwarding companies' gross profit and global rank with their website's social

traffic and keywords linked to them, and their influence from crowdsourcing platforms' referral and search traffic.

#### 4. Discussions

The purpose of this paper has been the deployment of an innovative methodological context with the purpose of suggesting different ways of harvesting web data from various sources for digital market strategy refinement. Through our analysis, we collected and analysed website data, leading to significant outcomes for marketers and strategists to deploy an optimised digital marketing strategy compared to before. Results show significant impacts on air forwarders' gross profit and global web ranking from variation in their traffic/keywords, caused by specific sources of crowdsourcing websites' traffic. As a consequence, these traffic sources of the crowdsourcing website a company uses could be considered valuable for SEO and SEM strategies, due to their direct effect on the company's gross profit and global ranking. As stated before, the more visitors a page has the more popular they are, with a possible increase of their brand name [21]. Therefore, we emphasise the importance of specific types of crowdsourcing traffic directly to firm's traffic and keywords volume and indirectly to its brand name (through gross profit and global web ranking).

Moreover, we chose five popular crowdsourcing websites and five websites of the most known air forwarding firms and found that their web traffic and keywords volume impacts the variation of gross profit and global web rank, caused by certain crowdsourcing traffic types. In particular, referral and search crowdsourcing traffic influenced air forwarders' gross profit and global ranking, after having affected their social traffic, and top 3 and total keywords volume. This leads to further extension of awareness about possible factors affecting a firm's global rank and gross profit, through variation in their web organic traffic and keywords explained by crowdsourcing traffic. Marketers and strategy managers can benefit from these insights when planning and organising efficient SEM and generally digital marketing strategy and product promotion.

Summing up the future research sector, we should provide research frameworks with more practical data, referring to the results of our proposed model. Eye tracking and emotion analysis plays a major role in neuromarketing, with potential buyers oriented where the highest number of fixations exist in a website [61]. As people enter a website, their eyes begin to move and focus on information that provokes their interest, expressing emotions through this observing and focusing process. Emotional pictures and contexts have more chances to catch the eye of the visitor and produce pleasant emotions, based on their facial expressions [62].

Furthermore, we gathered five individuals, not by definition of potential customers, visiting the website of an air forwarding company included in our research, in order to gain valuable insights on the method's possible implementation in digital marketing strategies. The possible implication of eye tracking and emotions in the marketing and especially digital marketing sector are infinite. An adoption of visitor eye tracking and emotions during their stay at a webpage can lead to better understanding of the site's parameters, affecting visitors' behaviour and better planning of firm's digital marketing strategy, aiming at its optimisation as well as an enhancement of the firm's brand name and profit.

#### 5. Conclusions

##### 5.1. *Crowdsourcing Platform Traffic Implication in Air Forwarders' Brand Name and Profit*

A brand name happens to be one of the most important mechanisms for market failure deflection, which is caused by the appearance of asymmetry in information dissemination [63]. According to the financial perspective of brand equity, the brand name deflects the combination of the company's most profitable product names, highlighting the need for efficient product marketing strategies [64]. Crowdsourcing contributions in digital marketing can be mostly visible through crowdsourced tasks of information gathering [65] and consumer engagement [66]. Current technologies that rely on the crowd for expert

knowledge and system expansion are prevailing [67]. Based on the above, the significance of crowdsourcing activities for a company's strategy is rising, due to their many advantages, as is the importance of crowdsourcing data usage in its digital marketing strategy. These data contain multiple types of raw information, but we mainly focus on their web traffic.

In our research, we discovered that firms are affected by crowdsourcing traffic, social traffic and total keywords usage, and this has a negative impact on their gross profit, while they are affected positively by the firm's top 3 keywords usage; global rank is affected positively by all of the above. In this respect, some variables of a firm's brand name, such as gross profit and global rank, are affected by specific types of website traffic and keywords, providing useful variant insights for digital marketing optimisation. As Fedushko et al. [68] have shown, adoption and implementation of website tools for user engagement and other metrics observation can lead to enhanced business profits and web traffic etc. Our results also align with Järvinen and Karjaluoto's [69] outcomes, highlighting the role of web analytics in providing meaningful information regarding businesses' decision-making and marketing strategies.

The results of this paper indicate that specific types of crowdsourcing traffic can interpret global web rank and gross profits of firms, such as air forwarders, in our research. More specifically, we found that referral crowdsourcing traffic has a positive impact on air forwarders' gross profit, resulting in higher levels, while rising crowdsourcing search traffic leads to reduced air forwarders' gross profit. These results should be taken into consideration when examining the factors affecting a firm's brand name and profit. According to Ortiz-Cordova and Jansen [67], visitors attracted by expedited SEO and SERP have more chances to be turned into customers. Moreover, crowdsourcing analytics data produces great insights regarding web performance [38], and mixing it with proper decision-making channels tend to multiply their benefits [70], which is highly important for planning optimised digital marketing strategies.

Prediction models such as that by Ermagun et al. [71], based on crowdsourcing platforms, enhance customers' loyalty and satisfaction through marketing strategy improvements, gaining more and more visitors. Traffic analysis can show a handful of insights about a webpage's popularity and whether its performance conforms with the firm's targets [72]. On the same page, webpage referral traffic and keyword volumes lead to highly important information concerning SEM and SEO effectiveness [72]. Furthermore, whether a firm knows the types of crowdsourcing traffic that affect its profit and brand name generally, it provides useful insights for a firm's broader strategy [19]. Therefore, the variation of its website's traffic and keywords volume can indicate significant variation in global rank and profit. This creates big opportunities for firms to optimise their digital marketing strategy for SEO, SEM, SERP etc., by utilising their profit and ranking variation caused by specific types of crowdsourcing traffic.

We propose a three-stage methodology, starting with clear definition of KPIs (the proposed ones), then web data gathering and analysis and, at last, examining metric inter-correlations. The proposed methodology can reduce the managerial difficulties in handling web analytics in favour of digital marketing [69], given the hardships for marketers to match these metrics with the suitable KPIs [43]. Our answer to these problems is firstly the clear definition of the suitable KPIs for performance management, and later the focus on the involved metrics that need to be collected. In parallel, our suggested methodology enables marketers and strategists to better understand and harness crowdsourcing web data, at the same time as their own profit results, for digital marketing strategy optimisation.

### *5.2. Research Implications*

In this paper, our main focus was to examine and state the contribution of crowdsourcing platforms' traffic to air forwarding firms' brand names and the later effects on their website traffic and keywords volume, by deploying efficient predictive models and utilising the available mass-mode website big data. In order to specify the types of traffic and keywords involved most, we ran liner regressions and found that crowdsourcing

referrals and search traffic have significant impacts on air forwarders' social traffic, and top 3 and total keywords volume, which then significantly affects their global rank and gross profit. The  $R^2$  and model fit statistics fluctuate between 0.741 and 1 (Tables 6–9), highlighting the regression results [73].

In respect to the macro-level approach through Fuzzy Cognitive Mapping and the micro-level one relying on Agent-Based Modelling, more extensive research should be applied. In particular, the aspect of model adaptation and cognitive model display should be enforced with more discursive analysis, so as to achieve better understanding of the model's versatility and adaptation capabilities. This is due to the chaotic nature of big data and web analytics metrics, leading to hardships in measuring platform performance. Furthermore, there should be further research into analysing the opposite flow of impingement, meaning the impact of website traffic, keywords, and all sorts of web metrics to firm brand name variables. Results like these could provide much more accurate and unambiguous insights to marketers regarding digital marketing strategies and promotion performance measurements.

At last, in terms of the suggested innovative methodological framework, more investigation is required for its credibility and confirmation in terms of similar digital marketing frameworks. Domains such as social, paid, search, referral, mobile etc., expeditions like e-mail, atomic interviews, through phone calls etc., or a combination of the above parts can lead to more efficient and optimised frameworks. Despite this, our framework functioned effectively, providing a handful of insights for digital marketing strategies.

**Author Contributions:** Conceptualization, D.P.S.; Data curation, N.T.G.; Formal analysis, N.T.G.; Investigation, N.T.G.; Methodology, D.P.S. and N.T.G.; Project administration, N.T.G.; Software, N.T.G.; Supervision, D.P.S.; Validation, N.T.G.; Visualization, N.T.G.; Writing—original draft, N.T.G. All authors have read and agreed to the published version of the manuscript.

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## Appendix A

**Table A1.** JAVA coding route for defining Poisson distribution in crowdsourcing traffic and its impacts in air forwarding traffic/keywords and their effects on global rank and gross profit.

---

### JAVA Coding Route for Defining Poisson Distribution in Crowdsourcing Traffic Impacting Air Forwarders' Traffic and Keywords Volume and Their Effects on Global Web Rank and Gross Profit

---

```
{ case CrowdTrafficSource://(Simple state (not composite))
statechart.setActiveState_xjal(CrowdTrafficSource);
{
crowdsourcingTrafficSource = poisson(10000)
;}
transition1.start();
transition4.start();
transition.start();
return;
case CrowdSearchTraff://(Simple state (not composite))
statechart.setActiveState_xjal(CrowdSearchTraff);
{
crowdsourcingSearchTraffic = crowdsourcingTrafficSource*(0.159)
;}
}
```

---

Table A1. Cont.

---

**JAVA Coding Route for Defining Poisson Distribution in Crowdsourcing Traffic Impacting Air Forwarders' Traffic and Keywords Volume and Their Effects on Global Web Rank and Gross Profit**


---

```

transition7.start();
transition19.start();
transition29.start();
transition14.start();
transition25.start();
return;
case CrowdToTotKeyAF://(Simple state (not composite))
statechart.setActiveState_xjal(CrowdToTotKeyAF);
transition27.start();
return;
case TotalKeywordsAF://(Simple state (not composite))
statechart.setActiveState_xjal(TotalKeywordsAF);
{
totalKeywordsAirForwarders = totalKeywordsAirForwarders1 + totalKeywordsAirForwarders2
;}
transition17.start();
transition30.start();
return;
case WebAnalyticsToGlobalRank://(Simple state (not composite))
statechart.setActiveState_xjal(WebAnalyticsToGlobalRank);
transition32.start();
return;
case GlobalRankAF://(Simple state (not composite))
statechart.setActiveState_xjal(GlobalRankAF);
{
globalRankAirForwarders = globalRankAirForwarders + socialTrafficAirForwarders*(0.043) +
top3KeywordsAirForwarders*(3.099) + totalKeywordsAirForwarders*(0.925) +
directTrafficAirForwarders*(-0.002) + referralTrafficAirForwarders*(0.010)
;}
transition31.start();
transition12.start();
return;
case BounceRateAF://(Simple state (not composite))
statechart.setActiveState_xjal(BounceRateAF);
transition10.start();
return;
case CrowdToSocialAF://(Simple state (not composite))
statechart.setActiveState_xjal(CrowdToSocialAF);
transition2.start();
return;
case SocialTrafficAF://(Simple state (not composite))
statechart.setActiveState_xjal(SocialTrafficAF);
{
socialTrafficAirForwarders = socialTrafficAirForwarders1 + socialTrafficAirForwarders2
;}
transition9.start();
transition24.start();
return;
case CrowdToTop3AF://(Simple state (not composite))
statechart.setActiveState_xjal(CrowdToTop3AF);
transition21.start();
return;
case Top3KeywordsAF://(Simple state (not composite))
statechart.setActiveState_xjal(Top3KeywordsAF);

```

---

Table A1. Cont.

JAVA Coding Route for Defining Poisson Distribution in Crowdsourcing Traffic Impacting Air Forwarders' Traffic and Keywords Volume and Their Effects on Global Web Rank and Gross Profit
<pre> { top3KeywordsAirForwarders = top3KeywordsAirForwarders1 + top3KeywordsAirForwarders2 ;} transition11.start(); transition26.start(); return; case BounceRateCrowd://(Simple state (not composite)) statechart.setActiveState_xjal(BounceRateCrowd); transition6.start(); return; case DirectTrafficAF://(Simple state (not composite)) statechart.setActiveState_xjal(DirectTrafficAF); { directTrafficAirForwarders = crowdsourcingSearchTraffic*(-0.018) ;} transition16.start(); transition28.start(); return; case CrowdReferralTraff://(Simple state (not composite)) statechart.setActiveState_xjal(CrowdReferralTraff); { crowdsourcingReferralTraffic = crowdsourcingTrafficSource*(0.153) ;} transition3.start(); transition5.start(); transition20.start(); transition13.start(); transition22.start(); return; case ReferralTrafficAF://(Simple state (not composite)) statechart.setActiveState_xjal(ReferralTrafficAF); { referralTrafficAirForwarders = crowdsourcingReferralTraffic*(2.809) ;} transition8.start(); transition23.start(); return; default: super.enterState(_state, _destination); return; } } </pre>

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