AI and digital out-of-home advertising in smart cities

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Abstract
The purpose of the text is to explore some of the possibilities that artificial intelligence (AI) offers to increase the effectiveness of digital out-of-home (DOOH) advertising campaigns. The object of analysis is the creation of advertising content, with special attention paid to personalized advertising formats. AI's ability to analyze information based on user behavior, as well as tools to optimize DOOH advertising campaigns, are also covered. Previous studies are also analyzed regarding outdoor advertising and smart cities. Through content analysis the main aspects of DOOH advertising and smart cities are analyzed, so that a proposition could be made regarding their integration aiming at razing ads visibility and thus their effectiveness. The examples studied may lead to a better understanding of this relatively new and constantly evolving technology in the field of advertising. This is useful both for consumers who want relevant and interactive advertising content, and for organizations aiming to optimize advertising efforts and campaign effectiveness. The paper could be of interest to practitioners, academicians and students in the field of marketing, advertising, sales promotion and brand communication.

Keywords: artificial intelligence, digital out of home advertising, advertising efficiency, personalization in advertising, interactivity in advertising, intercultural characteristics in advertising.

1. Introduction
One of the oldest mediums for advertising is out-of-home advertising. If we stretch our imagination, we could trace back its roots to the earliest cave drawings, where men used to draw their everyday lives and thus give us information of their habitat. Of course, the evolution of out-of-home advertising is a long and tumultuous one. Richards would argue "that anything used to support, enhance or extend a brand is de facto advertising". [1]. Now, this very broad definition of advertising is not that far-fetched. For instance, before the age of common era, the Egyptian pharaohs used to build massive monuments – pyramids, statues with effigies, steles, etc. in order to promote their divine origin and power. "Stelae were the billboards of their time, used for one-way mass communication. They could be impressively large, though transportation of heavy rocks would have been problematic, and the fact that so many have been discovered is a testament to their longevity. Few ads today will last so long." [1]. Starčević [2] suggests these were powerful symbols as part of a pharaoh's brand. According to her, "All the symbols, figures and reliefs were focused on creating the image of a ruler as a god, in order to achieve an impact on people." [2]. If we take a huge leap forward in time to present day, we could also observe businesses or brands that make their best to be visible and exert perhaps the same influential image as pharaoh once did. One of the minor differences, of course, is that nowadays people are heavily burdened by various media striving for consumers' attention. "Mid-2024 forecasts projected that the global outdoor advertising revenue would amount to an estimated 49.7 billion U.S. dollars that year, of which 29.3 billion (or 59 percent) would come from traditional out-of-home (OOH) media, while digital out-of-home (DOOH) would account for the remaining 20.4 billion dollars (41 percent). Both segments were expected to expand as the decade unfolds, with total OOH ad spending reaching nearly 68 billion dollars by

2029, 29.8 billion (44 percent) of which will consist of DOOH." [1]. It would seem appropriate to point out the relevance of this medium with regard to its influence over consumers' visual attention and thus advertising efficiency.

2. Development of digital out-of-home advertising and AI

Although traditional out-of-home advertising still represents a slightly larger piece of the pie with regard to advertising expenditures compared to DOOH the latter "may be considered a more effective solution compared to traditional billboards as it reduces advertising costs, materials consumption, and offers video advertisements display." [1]. According to Roux and Waldt the out-of-home advertising has evolved a great deal from just being a simple static outdoor billboard next to the road [4]. Besides the obvious advantage of wider visibility throughout the night, DOOH offer additional criteria that add to its effectiveness. On such advantage is the capability to interact with the audience [6]. Interactivity is also key for marketing communication and especially advertising. Thus, this element becomes a crossing point between the urban environment, the outdoor advertising and the residents. Digital out-of-home advertising is the one marketing communication that could add a new and interesting meaning to the urban areas while bringing brands and people together in an involving and engaging, increasing enjoyment, interaction and quality of life. AI has also been found an affective tool in aiding the latter through dealing faster and more accurately with the increased number of inputs, trying to promote it to municipalities that are still reluctant to implement AI in their operations [107]. Seleka and Letaba regard the use of AI in DOOH advertising as the fourth industrial revolution [8]. They believe that in contrast with the third industrial revolution, where the information technology aided in the processing and transmission of data, with the emergence of AI the decision-making process would not be human but one on machine-learning. Being a subset of AI, it allows for computers to be independent of making reliable decisions [6]. Nowadays, such technologies as big data, artificial intelligence, internet of things and high-tech digital billboards are transforming the DOOH advertising business towards the new 4th Industrial Revolution. They enable for interactive personalized advertising that can implement technologies as sensors, GPS (global positioning system), cameras, facial or image analytics software, so that both businesses and customers are making the most of the advertising. "It can identify audience patterns, preferences and behaviours that can then be used in generating maximum advertising impact. The essence of what advertising is has remained largely unchanged for centuries and the advent of new technologies and the 4thIndustrial Revolution are a further reinforcement of the basic principle of advertising. That is, to call public attention to a particular need, service or product." [5]. Machine learning can be used as a very efficient tool for DOOH advertising that enables for targeted ad messages, particularly based on consumer behaviour. As, discussed, there are several technologies that AI implements, so that DOOH advertising is more effective [5]. Some of them are:

- Big data. In the previous lines I mentioned that big data was used in the 3rd industrial revolution in order to gather enormous amounts of data but still it was humans in the end that decided how to use it. Now it would be up to the AI make the appropriate decisions from the insight from big data.

- Facial recognition technology. It would allow for DOOH to anonymously analyze the audience in front of the digital billboard – how many people are there, how many of them are looking, basic facial traits that give away gender and age, etc. This way it would be possible to identify patterns of typical customer behaviour towards the target audience [2].
- Personalized advertising. Various online platforms have access to user information database, so that the relative ad is placed, based on user profiles. Such is the case in the social networks, and as an example serves Facebook, where specific ads are being placed in the newsfeed depending on user data. AI aided DOOH advertising could also make use of the same technology [2]. Thus, advertisers would be able to grasp more insight on user demographics, location, online behaviour, etc. which would enable them to create highly personalized advertising content.
- Real-time targeting. This process enables advertisers to alter the creative process while the ad campaign is running. Using data to understand the context of campaigns to the "here and now" implies that messages may be linked with consumer mindsets in the moment, thus becoming valuable and relevant [1]. For instance, DOOH billboards may integrate sensors which send information of the weather and in hot days cold beverages may be advertised and vice versa.
- Object recognition. This technology uses cameras that give away information to the DOOH billboard over who or what is in front of it. So that it would be possible to recognize items that are filmed by the camera; interpret and categorize those items; determine the position and distance of the object from the camera. camera. [8]. It would also be possible to simultaneously track various objects that are moving in front of the billboard, for instance, a particular brand and make of an automobile and place an ad that correlates to it.

What I would suggest is to take into consideration two more factors that could be added to the technology of AI, so that it enables for a better ad targeting in DOOH. The first one is interactivity, through which machine learning would be able to grasp a deeper knowledge of how customers interact, if they do, with the DOOH billboard, thus forming a more thorough image of the customer and its behaviour. The second one is the intercultural characteristics that are always into play when it comes to marketing communication. This way, AI could pay attention to the various customer profiles and relate them to specific predefined intercultural traits, so that a higher DOOH ad efficiency is achieved. Both of these factors would be analyzed in the next two sections.

3. Interactivity and DOOH advertising

It is only fair to ask the question: “What has interactivity, especially in advertising, has to do with the quality of life of cities’ residents?” Well, as an example would serve the city of Singapore, which was considered the smartest city in 2012, according to a ranking by Forbes [15]. A key component for this nomination was Singapore’s IT2000 plan, which was designed to create an “intelligent island” with IT (information technology) that would

transform work, life and play of its residents. It would be safe to assume that play has a lot to do with interactivity, which in basic consists of the words “inter” and “action” or through action. The definition of “interactive” [16] is 1: “mutually or reciprocally active”; 2: “involving the actions or input of a user”. The noun action is vital for the adjective “interactive” and it is only through action that people play, whether by themselves or with each other. Based on the components that comprise smart cities we inevitably see technology. And digital outdoor advertising is just the crossing point of people, technology, urban space and interactivity. But let us further dive into the notion of interactivity and its role in the efficiency of advertising.

Karimova [117]argues that interactivity is inherent in the traditional forms of advertising, as well as the so-called new media, denoting mainly the Internet. Her arguments are not without grounds however some of them may be approached from the philosophical perspective rather than the practical one. Basically, the proposed model of inherent components of interactivity in advertising consists of seven dimensions: active engagement and reaction; physical action; flow; involvement; control of consumers; two-way communication and feedback. We would analyze each of them and propose a solution and an addition that would better suit the needs of DOOH advertising and its role in smart cities.

The argument for active engagement is that consumers do so by interpreting, constructing and co-creating the meaning of the advertising. This may be found as a somewhat broad definition and it could be addressed to any form of communication that a user is influenced by. It would seem that this is a more passive role of the consumer than really taking an action toward the marketing communication of advertising. Which brings us to the second dimension – physical action. Karimova’s examples in this regard are quite apt that traditional advertising could also suggest that the user does a particular action toward the advertising – it may be as simple as rubbing a scented page of a magazine that advertises perfumes or as complex as building a model out of a magazine’s page. The third component is flow. Hoffman and Novak [2] state that there are two conditions that are necessary for the flow state to be in play – skills and challenges and focused attention. Any situation in which the skills exceed the challenge would result in boredom and when the challenge exceeds the skills the result would be anxiety. In either case the interaction between the customer and the ad would be interrupted. The fourth dimension, involvement, is really important for the interaction to be in place. Some researchers find a correlation between interaction and experiential involvement; they assume that the more immersive the experience, the more interactive it is [119]. The fifth dimension is control of consumers. It means that in a technology driven world the consumer could easily take control of what information is being mediated toward him. According to some researchers, traditional media does not give control over the content and form of the message to the audiences and Van Raaij [16] states that „traditional“ media is doomed to fade away. However, this seems far-fetched since we still have advertising through traditional media and the same applies to traditional billboards. The sixth component “two-way communication” is strongly defended by Karimova in that it is simply a tautology. Communication implies at least two sides or communicators and any communication is a two-way street. The seventh and last dimension is feedback. Some researchers characterize an ad as interactive when it provides feedback [7] [16]. In any form of interactive advertising the consumer could respond to the

message by participating in a series of online discussions and forums, providing comments, personal information, surveys or any type of feedback. Karimova's argument in this regard that any reaction on behalf of the customer, including buying or not buying the product may be regarded as feedback is not strongly supported.

All of the analyzed components play a vital role in the interactivity of advertising. What I would like to suggest is an additional component that seems at place – personalization of advertising communication with regard to behavioural data analyzed by AI. When a message is personalized, it speaks to a particular customer or set of customers. No matter the medium online or offline, personalization is key. In the DOOH environment personalization is played through contextual advertising. The same could be and is applied in the natural environment of cities' spaces. Though the interactivity is key for the digital media it is also present, as analyzed in the traditional ones, in most of the cases. What the digital environment presents is a higher degree of interactivity, as discussed earlier.

4. Intercultural characteristics of DOOH advertising

Throughout the scientific field culture has been given various definitions and there has been an ongoing debate as to whether or not it needs to be defined through a framework of dimensions. Hofstede defines those dimensions as an "aspect of culture which can be measured relative to other cultures" [3]. His theory has been used to understand the differences among cultures and is by far the most used and cited model when it comes to marketing research [1]. In his most renown work "Culture's Consequences" Hofstede outlines four dimensions of national culture:

- Power distance: the extent to which the less powerful members of institutions and organizations expect and accept that power is distributed unequally.
- Individualism versus collectivism: individualism is a society in which the ties between individuals are loose, everyone is expected to look after himself and the immediate family. On the other hand, collectivism is a society in which individuals from birth onwards are part of strong in-groups, usually the family, the extended family, the tribe, etc. In such a society people identify with "we", whereas in the individualist society they identify with "I".
- Masculinity versus femininity: masculinity is a society in which emotional gender roles are distinct. This is explained through how one should feel, for example the boy should be assertive and tough and focused on material success and the women should be focused on the quality of life. A feminine society would not have such a separation or the separation should be weakened, so that men are expected at times to be modest and tender and focused on the quality of life.
- Uncertainty avoidance: it is the extent to which the members of a culture of a national society feel threatened by ambiguous and uncertain situations. This means that in an uncertainty avoiding society uncertainty is a threat and must be fought, whereas in an uncertainty accepting society uncertainty is noble and life is accepted as it happens.

- Later in 1991 Hofstede added a fifth dimension “Long term orientation versus short term orientation”. In 2010, he added the sixth and final dimension “Indulgence versus restraint”.
- Long term orientation versus short term orientation: long term orientation stands for the fostering in a society of pragmatic virtues oriented to future rewards: perseverance, thrift, adaptation to changing circumstances. On the other hand, a short-term oriented society is more focused on the past and the present by national pride, respect for tradition, preservation of faith and fulfilling social obligations.
- Indulgence versus restraint: societies that are seen as indulgent allow relatively free gratification of basic and natural human desires, leading to enjoying life and having fun. Restraint societies suppress gratification of needs and are regulated by strict social norms.

These six factors play a vital part in where, when, how, etc. a DOOH advertising may be placed. AI driven machine learning could use these predefine traits, so that a relevant ad is introduced to the appropriate audience, while taking into consideration its intercultural characteristics.

5. Conclusion

The paper analyzed some of the key aspects of DOOH advertising, AI and smart cities. It proposed two additional components of boosting DOOH advertising efficiency – interactivity and intercultural characteristics of the audience. It is through personalized experience that people are encouraged to step out of their online word they constantly engage with through their smartphones and become involved with DOOH advertising in an interesting and enjoyable way. This way personalization becomes a crossing point between the urban environment, the out-of-home advertising and the residents. Besides interactivity, other major factors were found to play an important role, as well – involvement, active engagement and reaction, physical action. All of them add to and raise consumer engagement which is a new perspective on DOOH advertising that to this moment has mainly been a static experience and a one-way information flow. This way urban areas could increase their significance to locals and visitors while brands create engaging, enjoyable and interactive experience for citizens and tourist thus improving their total experience of the urban areas, whilst boosting brand awareness and/or creating opportunities for transforming them into loyal customers.

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