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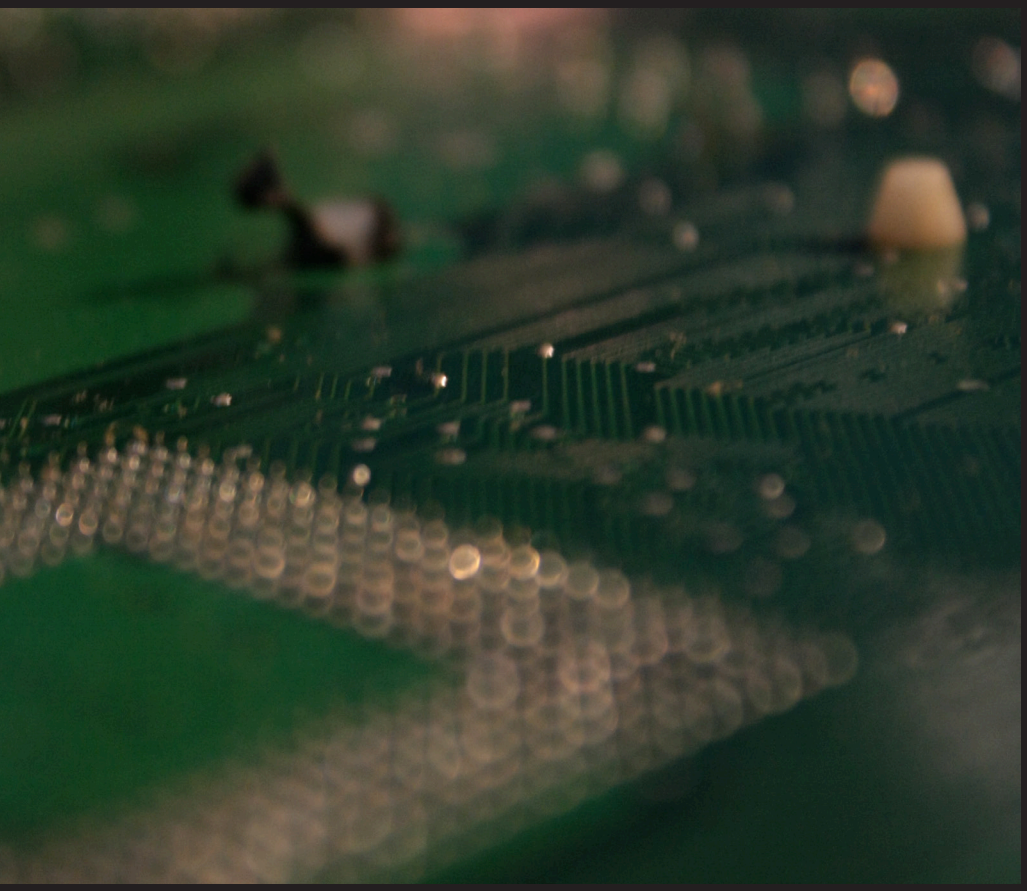

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EDITORIAL – From the Associate Editor

From my fellow associate editors and reviewers, it is my pleasure to present the 12th issue of the iSCHANNEL. Congratulations to our writers! To mirror the words of Associate Editor, Marta Stelmaszak, to submit to the journal is a worthy accomplishment and challenge for all who are dedicated to the process. To our readers, thank you for taking the time! We hope that in the next edition, we will be celebrating your work. As a note, we do not impose copyright on articles written so if you wish to develop your article further for other publications that is welcomed rather than discouraged (though a small acknowledgment would be appreciated).

In this edition of the journal,

Simon Draxinger uses Facebook Messenger as a case study to argue that chatbots are the potential outcome(s) of digital platforms' architectural principles. To strengthen this argument, the paper focuses on the theory of Layered Modular Architecture as proposed Yoo et al. (2010).

Yunjing Joyce Li assesses "Emergency." This innovative in-vehicle emergency response solution for the upcoming era of fully autonomous vehicles is studied as the example of an intelligent "personal assistant" system. In looking at this innovative emergency response solution, design analysis demonstrated that the interplay between human and digital agents will be determined not by machines but by the choices made by individuals, organizations and societies.

Curtis Goldsby examines a closed free-floating car sharing platform, DriveNow. In his analysis, the author determines that the platform struggles to capitalize on multi-sided network effects. Through analysis, the paper determines that closed platform born through traditional ventures, despite growth bottlenecks, also has the potential to disrupt industries.

Marina Alvarez studies how Vendor Relationship Management (VRM) systems, as tools for marketing and consumption practices, can affect aspects of consumer empowerment. Through recognizing the effects of discourses of knowledge, the paper uses the concepts of "choice" and "power" on narratives of information inequities and disciplining to establish a basis for understanding consumer empowerment through VRM systems for marketing and consumption practices.

As an MSc student myself, I know I am not the only one that found this year to be both intellectually stimulating and challenging. It would be amiss of me not to acknowledge the process the writers have gone through to present their ideas and give us the pleasure of reading them. The iterative process of the journal hoped to continue pushing the writers to think beyond established—and their own—frameworks to develop pieces that truly matter to them. The topics found in this journal represent the various interests of the writers and draws our reviewers to refine their ideas. Special thanks to all the reviewers, associate editors Joyce Li and Marta Stelmaszak, and our faculty advisor, Will Venters. The journal is an indispensable space and one we all enjoyed working on.

Mame Frimpong

Associate Editor

EDITORIAL – From the Faculty Editor

I am extremely pleased to see another edition of the iSCHANNEL published. Congratulations to Joyce Li, Mame Frimpong, and Marta Stelmaszak as associate editors who have done an amazing job this year. I would also like to congratulate the article authors who should be extremely proud to have a publication for their CVs. Finally, I would like to thank the reviewers who work so hard to improve the quality of the articles. Reviewers are often the unsung heroes of an academic journal. Unrecognised and unrewarded (apart from perhaps their name in small print in the cover) they must undertake considerable work if quality articles are to be published.

Academic publishing is founded upon the idea of double-blind peer review. Double-blind refers to neither author or reviewers knowing the names of the other side. Peer review refers to both author and reviewer being peers and thus somewhat equal in the evaluation. On this basis, a reviewer is not an expert "judging" the article, but a peer providing an honest assessment of its strength and weaknesses. Personally, when reviewing, I like to write as though it were not anonymous – so while the author might not like my review I seek to justify all my points so they can understand and appreciate my concerns. Above all, while peer review is an instrument of quality control and a judgement on the quality of the article, reviews must first and foremost be constructive and helpful. Reviews should aim to improve the quality of the article whatever the decision recommended to the editor (who ultimately make the decision alone). Good reviews carefully explain how the article might be improved, often starting with an overall evaluation, then working through the article section by section. Recommendations can be made, but reviewers should not demand that they be followed – they are only peers of the author after all. Reviewers can suggest alternative literature (perhaps missing) and provide examples of new ideas which might be included. Reviews should be prepared to critique hyperbole and unfounded assertions. They should also seek to point out mistakes and misunderstandings.

Alan Lee provides some very useful advice on reviewing (http://www.people.vcu.edu/~aslee/referee.htm) which I would urge our reviewers to consult. After all reviewing others' work carefully and tactfully is all a vital skill in professional life and worthy of learning well.

Finally, our reviewers should feel proud to see a paper that they reviewed published. In undertaking a detailed, constructive and helpful review they should see some of their own work in the final publication. And if the article is ultimately rejected by the editors they should be proud that they have provided the authors with useful lessons with which to improve their future work.

Dr. Will Venters

Faculty Editor

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The Generativity of Messaging Platforms: A Case Study on Facebook Messenger and Chatbots

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KEYWORDS

Generativity
Platform
Modularity
Chatbots
Instant messaging
Facebook Messenger
Machine learning
Natural language processing

ABSTRACT

This paper explains the integration of chatbots into messaging applications as a potential outcome of digital platforms' architectural principles and their characteristic of generativity. A case study of Facebook Messenger (FM) is adopted and analysed through the theoretical framework of layered modular architecture (LMA) proposed by Yoo et al. (2010). To understand the increasing diffusion of chatbots as a consequence of a platform's characteristic of generativity, this essay answers two distinct research questions (RQ) that are as follows: (1) How does layered modular architecture explain generativity on Facebook Messenger?; (2) What are the implications of automation in the form of chatbots on generativity?

1. Introduction

Chatbots offer businesses the chance to increase their customer outreach in unprecedented ways. Chatbots are automated programs which are incorporated into messaging applications. They are based on Artificial Intelligence (AI) to communicate with users, thereby providing a set of services and functionalities. Chatbots are deployed in a range of areas: from simple assistance, such as news coverage, weather forecasts and shopping assistance to business purposes such as customer service (Schlicht, 2016).

Using chatbots, enables a firm to instantly reach a great amount of people since messaging platforms are characterised by large user bases (Schlicht, 2016). Facebook Messenger (FM) for instance is used by over one billion people (Constine, 2016). Furthermore, according to The Q2 2016 Sprout Social Index (2016), 35.5% of respondents prefer social media as the best way for customer service, which constituted the top choice. Additionally, the Index indicates that the average number of social messages awaiting a response grew 18% in comparison to 2015, with brands' responding rates only amounting to 11%.

Due to the increasing importance of social customer care, businesses increasingly automate simple requests from customers by developing and integrating chatbots on messaging platforms (York, 2017).

The possibility for developers to build chatbots on Facebook Messenger was introduced during Facebook's F8 event in April 2016 (Schlicht, 2016). Just seven months after the official presentation, there were already 34,000 chatbots available on the platform (O'Brien, 2016). But how is this fast diffusion possible? This essay makes the assumption that a platform's architectural principles lead to generativity which in turn enables the fast integration of chatbots. In order to defend this assumption, this essay adopts the case of Facebook Messenger and examines its architectural components in the light of the theoretical framework of layered modular architecture (LMA) proposed by Yoo et al. (2010). This results in the first research question:

RQ1: How does layered modular architecture explain generativity on Facebook Messenger?

The article examines the emerging implications of incorporating chatbots on Facebook Messenger. Chatbots present automated applications that interact with individuals, thereby enabling unprecedented ways of data and content generation. Hence, the automation potential generated by chatbots might have implications on generativity. This essay elaborates on this chain of thoughts by posing and answering a second research question:

RQ2: What are the implications of automation in the form of chatbots on generativity?

The article is structured as follows. Section II provides a review of the literature that is relevant for the considered phenomena. Section III presents the theoretical framework being utilised. Section IV presents the case of Facebook Messenger and subsequently analyses it through the lense of the adopted theoretical framework. Section V reveals contributions, limitations and future research directions.

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2. Literature Review

This section presents a review of the literature that is relevant to this phenomenon and focuses on the platform concept, the underlying architectural principles and perceived gaps in research about generativity.

Platform Concept

Over the last 20 years, ubiquitous digitalisation and concomitant innovation have deeply affected individuals' lives and organisational activities. Together with the emergence of the internet that was able to support any information service and with digital devices being able to gather, store and process different types of data, a fundamental phenomenon emerged: the digital platform (Tilson et al., 2010).

The platform concept has been researched by many scholars in different fields such as product development, technology strategy, industrial economics and information systems (Baldwin & Woodard, 2009). Since each research field examines platforms in different contexts, various definitions and terms emerged. In the product development field, Wheelwright and Clark (1992) coined the term "platform product". This refers to novel products that satisfy the needs of core customers but that can also simultaneously be modified into derivatives by the process of adding or removing features.

Technology strategists study principles of how to organise and manage the network of firms that surrounds platforms. Based on this research area, Gawer (2009, p. 45) introduces the term "industry platforms" and characterises them as "building blocks (they can be products, technologies or services) that act as a foundation upon which an array of firms (sometimes called a business ecosystem) can develop complementary products, technologies or services".

Scholars of economics literature adopted the term platform to describe a product, system, service or organisation that mediates transaction of goods, services or social currency between various agents, consequently creating value for all participants (Parker et al., 2016; Rochet & Tirole, 2003). Corresponding literature stresses the fact that network effects across different groups in multi-sided markets result in a 'chicken-or-egg problem' that has to be addressed by platform-owners by cross-subsidising between agents or following certain strategies (Parker et al., 2016).

Scholars of the information systems (IS) field such as Tilson et al. (2010) utilise the term of the "digital infrastructure" in order to characterise systems that can serve as platforms. Hanseth and Lyytinen (2010, p.1) use the term "information infrastructure" and specify it as a "shared, open, heterogenous and evolving sociotechnical system of information technology capabilities that are recursively composed of other infrastructures, platforms, applications and IT capabilities and controlled by emergent, distributed and episodic forms of control". The authors maintain that concepts such as platforms are used in relation with software-based systems, while terms such as digital or information infrastructures comprise a broader scope of systems from software to hardware infrastructures. However, the common denominator of platform-related literature in the information systems field, is to look at large and complex information systems as platforms, on which new products and services can be added to benefit from shared data (Tilson et al., 2010).

Despite different definitions of platforms across varying research areas, there are common structural features, that is, a common platform architecture which is based on the reutilisation and sharing of common core components across different products and services (Baldwin & Woodard, 2009).

Platform Architecture

According to Baldwin and Clark (2000), architecture is the function-to-component mapping with interfaces being incorporated into the design rules for building a modular system. Elaborating on the definition above, (Baldwin & Woodard, 2009, p.23) conclude that "all complex man-made systems, including all products and processes, have architectures". The authors further maintain that a crucial feature of platform architecture is the composition into components that stay fixed over a platform's life time and into components that vary across sections or which are modified over time. Besides elaborating on the reuse and sharing of core components, this definition proposes the importance of interfaces for platform-evolvement.

According to Baldwin (2008), interfaces constitute "thin crossing points" between platform components and serve as design rules that govern and constrain the relationships between components. Interdependencies and interactions, therefore have to comply with carefully designed interface specifications (Baldwin & Woodard, 2009). Additionally, interface creation is tightly related to the concept of modularity of physical products, since these points of control form boundaries between different modules of the architecture. Modules are platform-components, whose subcomponents are tightly interlinked with each other and loosely connected to other subcomponents of different modules (Baldwin & Clark, 2000). In a modular architecture, interfaces between different modules are highly standardised (Yoo et al., 2010). It allows a product to be decomposed into weakly coupled components that are linked by prespecified interfaces. This decreases complexity and increases flexibility in product design (Baldwin & Clark, 2000). Modularity itself describes the extent to which this decomposition is possible (Schilling, 2000).

Yoo et al. (2010) argue, however, that the ubiquitous digitisation – the process from translating analog signals into digital formats (Tilson et al., 2010) – and the growing incorporation of digital components into physical products, lead to a new form of product architecture: the layered modular architecture.

This new type is a hybrid between the modular architecture and the layered architecture that is characterised by the four weakly coupled layers of devices, networks, services and contents brought forth by digital technology. While components of a modular architecture are product specific and restricted by a fixed product boundary and thus following a functional design hierarchy (Clark, 1985; Baldwin & Clark, 2000), components of the LMA are 'product agnostic'. By connecting components pertaining to various layers, new products can be created (Clark, 1985). Furthermore, innovations can emerge at any layer, independent of other layers. LMA's characteristics are thus laying the grounds for generativity (Yoo et al., 2010).

According to Zittrain (2006, p. 1980), generativity is "a technology's overall capacity to unanticipated change through unfiltered contributions from broad and varied audiences". Tilson et al. (2010) describe generativity to be the prize for exploiting possibilities enabled by the flexible nature of digitising. In addition, the authors point to the paradox nature of control, which confronts the conflict between openness and closeness, to understand generativity and the dynamics of platform growth. Platform openness can be regarded as the degree to which a platform is centrally controlled to harness value and maintain power or to which extent it is open to the public (decentralised control) to benefit from efforts and innovations by third parties (Ghazawneh & Henfridsson, 2013). Platform openness can be studied through the lense of technical openness, that is, how Application Programming Interfaces (APIs) and Software Developer Kits (SDKs) restrict and control access to core components of a platform (Anvaari & Jansen, 2010). A further means to examine openness is by applying the perspective of organisational openness. This relates to ways in which platform-owners, developers and end-users are able to engage in development and usage of the platform (Economides & Katsamakas, 2006). The design of platform openness therefore, influences the degree of generativity and thus the potential of independent developers to innovate and produce content in the form of products or services on the platform (Eaton et al., 2015; Tilson et al., 2010).

After reviewing the relevant literature, one can assert that the notion of generativity occupies a prominent part in academia. However, there is little to no research about generativity of messaging platforms despite their increasing importance. Additionally, current definitions of generativity accentuate the manual participation of complementary providers. The increasing emergence of automation in the form of chatbots however, might have implications on generativity as we know it to date.

3. Theoretical Framework

Given the need to shed light on both the generativity of messaging platforms and the imposed implications on generativity by incorporation of automation in form of chatbots, the theoretical framework by Yoo et al. (2010) is adopted because of its holistic view of platform architecture and explanation of generativity as an ultimate outcome of these architectural principles.

The layered modular architecture constitutes a hybrid model between the modular architecture of physical products and the layered architecture of digital technology. Digital technology differs from traditional technologies in three distinct ways. First, it is reprogrammable, meaning that software code that manipulates data in specific ways can be changed without modifying the physical embodiment in which the data is stored and thus enabling a digital device to perform various tasks. Second, digitisation is translating heterogeneous, analog signals into machine-readable digital format, i.e. binary digits which can be processed by any digital device. This translation is commonly referred to as the homogenisation of data. Third, digital technologies enable digital innovation which is defined as new combinations of physical and digital elements. Increasing diffusion of innovation leads to positive network effects that further foster the creation of digital devices and services. This, again, enables digital innovation due to decreased entry barriers and learning costs. This cycle is referred to as self-reference. These features of digitisation mark a change in design practice and lead to the emergence of the layered architecture.

The layered architecture comprises four layers – contents, service, network and device. The device layer constitutes the physical machinery level (hardware) and the logical capability layer (operating system) while the network layer encompasses a physical transport layer (cables and transmitters) and a logical transmission layer (network standards and protocols). The service layer includes applications for the user (creating and consuming content) and the contents layer consists of data such as texts, images, metadata and directory information.

Most importantly though, the layered architecture highlights the separation between physical components of the device from the applications that run on it, that is, the disentanglement of the physical layer from the service layer which is enabled by the reprogrammability of digital products. Furthermore, the characteristic of data homogenisation enables the separation between the way data is stored and manipulated and the way it is transmitted which can be regarded as the disentanglement of the contents layer from the network layer.

The four layers constitute different design hierarchies and the respective component design on each layer is independent from other layers. This equips designers with combinatorial possibilities since they can put together components from different layers using standards and protocols (Gao & Iyer, 2006), thereby enabling great levels of generativity (Zittrain, 2006).

Due to the pervasive embeddedness of digital technology into traditional artefacts, the layered modular architecture arises. The degree to which the layered architecture extends the modular architecture

determines the extent of generativity (Yoo et al., 2010). As was already noted in Section III, a full-blown modular architecture is restricted by a fixed product boundary, meaning that its elements adhere to a single design hierarchy (Clark 1985, Baldwin & Clark 2000), thereby rendering relationships between product and components nested and fixed. Components are product specific and the flexibility of a modular architecture is related to the substitution of elements within the single design hierarchy (Yoo et al., 2010). LMA on the other hand, is not based on a fixed product boundary, implying that its components do not follow a single design hierarchy of a given product but are regarded as elements that pertain to different layers with each layer following a different design hierarchy. Components can be loosely coupled, thereby inductively enacting a product (Clark, 1985). This means that a component can be regarded as a standalone product and simultaneously be used as an element in a different product in a variety of ways. The components are therefore product agnostic and their loose combination across layers enables the emergence of innovations on any layer thereby creating generativity (Yoo et al., 2010).

4. Case Analysis – Chatbots in the Facebook Messenger

This section presents the case of Facebook Messenger and its subsequent analysis through the lense of the theoretical framework, thereby answering the two research questions identified in Section I.

RQ1: How does layered modular architecture explain generativity on Facebook Messenger?

FM's architecture follows the principles identified by Yoo et al. (2010). The device layer consists of the physical machinery level (computer hardware) and the logical capability level (operating system). Facebook Messenger is built upon internal hardware such Central Processing Unit (CPU) and Random Access Memory (RAM). Concerning the logical capability, the Messenger can be downloaded on devices running on operating systems such as iOS, Android, Windows and Linux.

The network layer encompasses a physical transport layer (cables, transmitter set etc.) and a logical transmission layer (network and application protocols). FM's data is sent in the form of bits via physical transportation means such as radio frequencies (e.g. Wi-Fi) and/or Ethernet cables. Furthermore, Messenger uses the Transmission Control Protocol/Internet Protocol (TCP/IP) as network protocol in order to provide a reliable, ordered and error-free delivery. The FM application utilises the Message Queue Telemetry Transport (MQTT) as application protocol (Karasiewicz, 2013) in order to send data to and retrieve data from the FM servers.

The service layer is concerned with application functionality. Here, users operate as they create, change, save and consume content. With FM, users can text, share photos and videos, voice call, videochat, use augmented reality, search for people that are on the platform and use and search for chatbots. People are also able to develop and deploy applications upon the Facebook Messenger Platform by using Facebook's SDKs and APIs (Facebook for developers, n.d.).

The content layer consists of data that is stored and shared and furthermore comprises metadata and directory information. Data bases take an essential role in this level. FM uses sophisticated data bases to store data such as texts, pictures and sounds, metadata and directory information about the origin, ownership and copyright of shared content. Components of FM's architecture are product agnostic and don't follow a single design hierarchy. Innovations and improvements in the physical machinery level such as CPU and RAM, do not have implications on developer tools or programming languages used to create applications on Messenger. Same counts for protocols such as TCP/IP and MQTT. Furthermore, alterations in data storage such as switching from relational databases to in-memory or column oriented databases don't affect the design hierarchy of other layers of the Facebook Messenger and vice versa.

FM serves as a standalone product but since its components are connected to different layers, they can be incorporated into other products as well, that is, Facebook Messenger as part of another product. Besides traditional texting (standalone product), many applications incorporate Facebook Messenger APIs in their architectures so that users can share content over Messenger with their friends (Facebook Messenger as component of a different product). Dubsmash for example allows its users to share content via Messenger (Trisha, 2014). The opportunity to bundle FM with a host of heterogenous devices such as smartphones, tablets, desktop computers, smart TVs and cars, equips designers with combinatorial possibilities since they can put together components from different layers using standards and protocols, thereby building new products. This implies that Facebook Messenger's designers cannot fully anticipate all the potential ways that Facebook Messenger as a component will be used. The layered modular architecture fosters generativity.

Chatbots represent the latest example of innovation that emerged on Facebook Messenger. They are being deployed within the application layer and the data they generate is stored in the contents layer. A chatbot can be built and incorporated in two different ways: either via the FM developer's guide or via an automated bot creator. While the latter increases the development speed, the first gives the developer more room for innovation (Schlicht, 2016). Chatbots are implemented via standard APIs (ibid.). CNN for instance built its own chatbot and thus acts and innovates on FM's service layer as a third party provider. CNN needs no specific product related knowledge about the Facebook Messenger. It simply has to include the API and use Facebook's SDK to connect their bot to the platform (Schlicht, 2016)

A layered modular architecture furthermore helps to scale up platforms quickly without creating too much complexity and thereby threatening performance and thus generativity. The instant messaging function can

be regarded as Facebook Messenger's installed base. This is also commonly referred to as the core interaction, that is, the exchange of values that attracts most users to the platform (Parker et al., 2016). New features and applications are loosely added as peripheral components upon the core interaction through APIs and SDKs. Since they are not incorporated into the central core, they do not threaten speed and usability of the platform.

Chatbots are not integrated into the core of the platform. Users that do not wish to communicate with chatbots are thus not at risk to suffer from lower speed and platform performance because chatbots do not interfere or draw away resources from core activities, that is, instant messaging among users. A user simply has to use the search function of the FM to find and start a conversation with a chatbot. The implications of the increasing diffusion of chatbots lead to the second research question.

RQ2: What are the implications of automation in the form of chatbots on generativity?

Chatbots present automated applications, thereby enabling unprecedented ways of data and content generation. Chatbots take advantage of natural language processing (NLP) and machine learning algorithms to offer users a smarter and more engaging conversation experience (Anon., 2016). NLP enables the chatbot to extract intent and entities from a user's message. The intent represents the request or action the customer wants to take and entities offer information to provide context for a request or further information to finish an action. With users sending different messages, machine learning algorithms are used to identify similar phrases for each intent. Consequently, chatbots enable users to hold natural conversations to access contents and services so that they do not have to rely on traditional navigational and search capabilities (Galer, 2017). Chatbots then follow up with direct answers, requests for additional information or recommendations for possible actions (Anon., 2016).

A chatbot delivers data-driven results and because of its capability to learn over time, the process will get faster as the chatbot faces similar requests regularly (Newman, 2016). Additionally, chatbots should be able to learn within a conversation, that is, understand and elaborate on customer preferences to reply with tailored services or offers. After a user is starting a conversation with the bot, the intent and entities of the message are stored in the firm's database. The chatbot attempts to reply to the posed question or request in the best possible way. By reviewing the customer's reaction, the machine learning algorithm allows the bot to make changes to its perception about the customer and insert the updated data into the data base. In order to learn more about the customer, bots can use sophisticated analytics and data mining techniques to make sense of the gathered data and find patterns. This can result in intelligent follow-up messages that offer additional out of the box services which the customer generally wants but may not have thought of in that moment. This might increase customer satisfaction.

By determining what customers want most, chatbots might also unveil possibilities for new applications that help fulfilling those novel customer demands. Just like humans, the ability of chatbots to make meaningful connections with company-wide resources leads to success (Galer, 2017).

While generativity was generally perceived to be the outcome of creative thinking and innovation of third party providers, i.e., manual in nature, above reasoning strengthens the possibility of generativity becoming increasingly semi-automatic, with bots coming up with creative ideas and solutions and developers coding the proposed applications.

The aforementioned thoughts shed light on bot-utilisation in an external focus. A chatbot's internal applications might, however, be even more valuable. Chatbots have access to a firm's databases and thus are able to perform the same tasks as most applications in one integrated system. Chatbots could therefore be able to render applications obsolete in the near future. By deploying their learning algorithms, chatbots can understand and serve an employee's specific needs, thereby tailoring results and eliminating non-relevant data. This reduces the effort to use many applications and search through work data to complete daily tasks. Employees simply have to ask their individual chatbot to deliver the required information – no matter if internal firm related information or public information online (Newman, 2016). By accessing organisational information in real time, developers can allocate more capabilities to the creation of innovative and user-centric applications. Since more time is spent for development, this might increase the degree of generativity witnessed on a platform.

5. Conclusion

The essay examined the rise of chatbots on messaging platforms. The topic's relevance becomes clear in the light of the increasing diffusion and improvement of chatbot-technology and its implications on platform growth. A case study on Facebook Messenger has been presented and examined. The essay focused on two phenomena related to the architectural design, which enables the fast diffusion of chatbots, and to the potential consequences of chatbots on platform generativity. These two phenomena have been investigated and uncovered in the context of literature that is suitable for the considered topic. A theoretical framework based on the efforts of Yoo et al. (2010) has been applied to structure the examination of the case.

The essay conveys the following contributions. First, it gives evidence that FM's architecture adheres to the principles of layered modular architecture and thus gives explanation for the increasing emergence of chatbots on the Messenger Platform. Secondly, it shows that chatbots might be in the position to render generativity increasingly semi-automatic, since they are able – due to NLP and MP – to automatically gather and combine data in unprecedented ways, thereby creating new insights and ideas which

are then manually codified into new applications by developers. The possibility of having totally automatic generativity is not unlikely, since chatbots might at some point possess the ability to write code themselves. Third, the essay points out how chatbots can increase the level of generativity, since they can serve as central applications which provide developers with tailored organisational information in real-time. Hence, developers have more time to create user-centric applications, thereby fostering generativity.

The present work also bears some limitations and future research directions. First, the essay examines a single case that is certainly relevant due to the size and importance of the company and its massive user base but might not cover all aspects and criteria important to the considered phenomena. Hence, research about other messaging platforms (e.g. WhatsApp, We Chat, Slack, etc.) might be enlightening in relation to the discussed issues. Second, the conceptual analysis is purely based on available sources and documentations and certainly lacks internal viewpoints. Thus, future works could give consideration to on-the-field interviews. Lastly, the essay focuses on chatbots which represent a novel technology. There is still a lack of academic literature about their implications and potential. Future research might therefore reveal further details about this technology.

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Establishing Shared Control between Digital and Human Agents in Cyber-physical Systems

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KEYWORDS

Sociomateriality
Distributed Multi-Agent System
Cyber-physical System Design
Autonomous Cars
Service Innovation

ABSTRACT

This article presents a key design principle behind an innovative artefact created for the course MG4C3 "Information Technology and Service Innovation" at the LSE. The author identifies the socio-technical mechanisms of establishing shared control between digital and human agents in cyber-physical systems during the process of system design. To illustrate the responsibilities and capabilities across interface, information and task agents, "Emergency," an innovative in-vehicle emergency response solution for the upcoming era of fully autonomous vehicles is studied as the example of an intelligent "personal assistant" system. The case of "Emergency" instantiates agents' activity allocation and control through a series of concepts: 1) a distributed multi-agent system with different types of autonomous interface agents to reach a common goal - responding to passengers' emergency requests, 2) an organizational informational services theory that distinguishes the roles of information agents and task agents, and 3) a human-in-the-loop model in preparing digital augmentation of the emergency service operations in an interactive system. The design analysis demonstrates that the interplay between human and digital agents will be determined not by machines but by the choices made by individuals, organizations and societies.

Links to the Prototype and Introduction to the Connected Car App "Emergency":
- Link to Prototype: https://xd.adobe.com/view/77b55230-5d65-4023-ade5-44da7f96d9db/
- Link to Video: https://www.youtube.com/watch?v=XH9CLVZp_wY&feature=youtu.be

Introduction and Context

Futurist Arthur C. Clarke's adage that "any sufficiently advanced technology is indistinguishable from magic" seems especially true to people who are unfamiliar with recent technological innovations. People all around the world today find cyber-physical systems and digitization of everyday things are quickly penetrating all aspects of their lives. At the rate of exponential growth, various kinds of automation continue to liberate humans' bodies and brains from all sorts of tasks (Brynjolfsson & McAfee, 2014). With the help of intelligent digital agents, we can make many decisions more efficiently within shorter amount of time. On the contrary, humans also find themselves exposed to many short-term and long-term risks. More and more workers worry about losing their jobs to robots, while thinkers ponder the paradox of automation which reflects humans' diminishing skills due to over-reliance on automation (Carr, 2014; Harford, 2016).

Regarding the role of autonomous agents, academics repeatedly emphasize that these computational systems need essential functions to perceive complex dynamic environment, interpret perceptions, and autonomously act upon the environment in order to realize a set of goals for which they are designed (Maes, 1995; Russell & Norvig, 1995; Hayes-Roth, 1995). Despite the accelerated progress in artificial intelligence, using technology agents doesn't imply giving up all human control. In the case of a fully autonomous vehicle, the passenger can determine the destination and give up some control to the car, because he/she can neglect which exact route is taken to reach each destination. As car manufacturers launch more AI features, new cars are able to make decisions and take actions without drivers' inputs. Rather than studying humans' control of technologies or technologies' replacement of humans, this study recognizes the distributed collaboration process between the two.

This article presents a key design principle behind an innovative artefact created for the course MG4C3 "Information Technology and Service Innovation" at the LSE. The design product "Emergency" is an innovative emergency response solution in the upcoming era of fully autonomous self-driving cars.

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Shared control is an especially important aspect in the "Emergency" system design. This system presents an innovative emergency response solution for the upcoming era of self-driving vehicles. Building the sense of trust and control is a key challenge in designing user-agent collaboration. Users should be able to turn over control without feeling out of control. In the context of the system integrator "Emergency," passengers, central emergency responders and local emergency units are the users of this service. In each stage of the human-machine interface design, developers must clarify who is in control and prevent unintended control from taking place in case of urgent situation (Torngren et al., 2014).

Analyzing the responsibilities and capabilities across interface, information and task agents in "Emergency," this essay elaborates on the establishment of shared control between digital and human agents in cyber-physical systems (CPSs). It applies the concepts of a distributed, multi-agent system, organizational informational services theory and human-in-the-loop CPS to many shared control features. The main body discusses the key design decisions of "Emergency" in the light of intelligent computing systems literature. The final section gives the essay limitations and a short conclusion. Peer-reviewed journals such as MIS Quarterly, Journal of Information Technology, Artificial Intelligence, as well as other governmental and academic publications were searched using terms such as "agent-based software," "intelligent system design" and "CPS principles."

The Sociomateriality Literature

The complicated connected world is built of fragmented systems made of specialized domains of skills and collaboration. To unveil the hidden intentions and actions behind the complexity, the concept of agency is explored in this paper. Roberts and Grabowski (1996) posits technology as including three aspects: mechanical systems (i.e. hardware); human systems (skills and human energy); and knowledge systems (abstract meanings and concepts). Through studying the foreground patterns within the constitution of organization practices, a sociomateriality lens is valuable in contributing to the management knowledge in the connected world. This paper focuses on the very idea of human-machine interaction in a distributed collaboration environment.

The popular debate over the design and arrangement of the interactions between human and machine agency has received attentions from multiple fields. Jones summarizes the conceptualization of sociomateriality by highlight the key characteristic of the concept: materiality, inseparability, relationality, performativity, and practice (2014). A strong view of sociomateriality supports the view of organization in a perpetual state of becoming, whereas a weak perspective of sociomateriality focuses on the relative stability and similarity of practices enacted within a particular setting, some of the properties of which may be considered to be relatively enduring and independent (Jones, 2014). According to Orlikowski and Scott, sociomateriality moves away from how technologies influence humans to examining how materiality is intrinsic to everyday activities and relations (2008).

One stream of sociomateriality focuses on the deterministic relationship between social and material agents. According to Wooldridge and Jennings's study on the theory and practice of intelligent agents, abstraction tools like information systems are intentional systems embedded in belief, desires, and rational acumen (1995). Information attitudes such as belief and knowledge are coupled with pro-attitudes such as desire, obligation, and commitment etc to make up these intentional systems in modern working environment. Within this context, the most general way in which the term "agent" is used to reflect computer systems with the properties with autonomy, social ability, reactivity, and proactiveness (Wooldridge & Jennings, 1995). A stronger notion of "agent" is conceptualized by giving agents human-like attributes such as mentalistic and emotional agents (Bates et al., 1992; Shoham, 1993). From a more conventional point of view, scholars tend to separate material agencies from the social agencies in theorization. Leonardi (2012) mentioned that social and material are within different realm. Social agency is coordinated human intentionality, while material agency are the ways in which a matter's act is provoked or instructed by humans; therefore, social agency and material agency are different in nature with respect to intention, they impact, mutually shape, or mediate each other and become imbricated in social practice.

Another stream of sociomaterial conceptualized entities are mutually dependent ensembles in organizational realities, constantly facing embedded and emergent interconnections. This processual logic sees interactions and outcomes as mutually dependent, integrative, and co-evolving over time (Orlikowski and Scott, 2008). Zammuto et al (2007) advocate using the notion of affordances to examine the dynamic and often unpredictable interplay of IT and organizations. The third stream of sociomateriality takes this view even further to dissolve the boundaries between humans and technology. Agency is an ongoing reconfiguration of the world, so it is important to think of social material world as inseparable and constitutively entangled (Barad, 2003).

From the stronger perspective of sociomateriality, different disciplines explore the relationships among entities. Andrew Pickering, the philosopher and historian of science, proposed "the mangle of practice" theory by arguing that "material and human agencies are mutually and emergently productive of one another" (1995). His intricate study of a physicist's experiment showcases that in no agency or discipline is actually in full control within any situation: human practitioners are continually adapting and adjusting their actions in order to accommodate the emerging material resistance (Pickering, 1996). In her theory of agential realism, Karen Barad, a feminist theorist

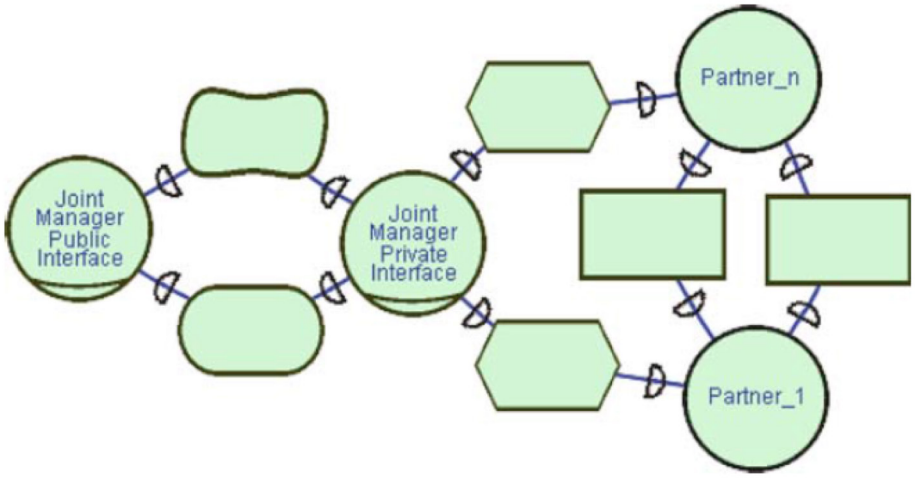

Figure 1: Example Multi-Agent Interface Structure (Kolp, et al., 2006)

who inspired many scholars in computer science and information system, argues that agency is "the enactment of iterative changes to particular practices through the dynamics of intra-activity" (2003). In fact, the world we are in today is indeed an agential intra-activity in its own becoming. From this perspective, we can understand the world as an activity filled with reconfigurations, relationship, and entanglement; and matter as a stabilizing and destabilizing process of interactive intra-activity (Barad, 2003). Entities, human beings, and things exists only in relations: they are performed and continuously brought into being through relations (Cecez-Kecmanovic et al., 2014). The following three sections apply specific sociomaterial frameworks in the system design of the connect car application "Emergency" to recognize the relationships between entities in the world of autonomous cars.

Distributed Multi-agent System

Recent advances in vehicle connectivity catalyzed new services that span across multiple industry domains. Essentially, "Emergency" builds a system of systems (SoSs) that constructs multiple evolving large-scale systems and coordination among vehicle infotainment systems, emergency response systems and wireless communication infrastructures (Jennings, 2000; Torngren et al., 2014). In order to manage a wide range of objectives such as automating priority travel and delivering emergency response services, system designers have to break down legacy technical and organizational barriers and build new barriers to lay down the control mechanisms among the subsystems.

"Emergency" is a distributed multi-agent system with different types of autonomous problem-solving agents to reach a common goal - responding to passengers' emergency requests (Kolp et al., 2006). Depending on the unit of analysis, these autonomous agents can be categorized into three groups: 1) interface agents that represent human interests, 2) task agents that resolve problems, and 3) information agents that link to data sources (Sycara et al., 1996). This section analyzes the relationships between the partner organizations by extending organizational theories to the design of interface agents. The agents in the system include both machines and humans that coordinate their actions in order to perform better than their isolated states (Pendharkar, 2007). This digital artifact exhibits the attributes of a large and spatially distributed system with complex dynamics such as distributed management, partial autonomy in the subsystems and dynamic system reconfiguration along its implementation roadmap (Thomson et al., 2015). To make the "Emergency" service possible, the system needs to define the shared responsibilities and control among the key organizational partners: automakers, central emergency response centers and local emergency units like A&E departments. These partners can leverage the distributed digital re-combinability nature of autonomous cars through Vehicle to Everything (V2X) connectivities.

The philosophy of service oriented architecture is incorporated in "Emergency" to deal with the subsystems' complexity and flexibility. This essay adopted Kolp et al. multi-agent modelling framework to better understand the control mechanism among the partners (2006). The strategic alliance format of joint venture can be used as a metaphor to link specific facets of the involving partner organizations.

Figure 1 lays out an example of multi-agent structure for joint venture systems (Kolp, et al., 2006), and showcases the following collaboration requirements:

1. The joint manager actor ("Emergency") has a public interface role to represent the interests of external stakeholders (passengers), and define the design strategy for its private interface that represents the interests of operational partners.

2. The joint manager actor ("Emergency") has a private interface role to coordinate tasks among operational partners;

3. Partners depend on each other for providing and receiving information and resources.

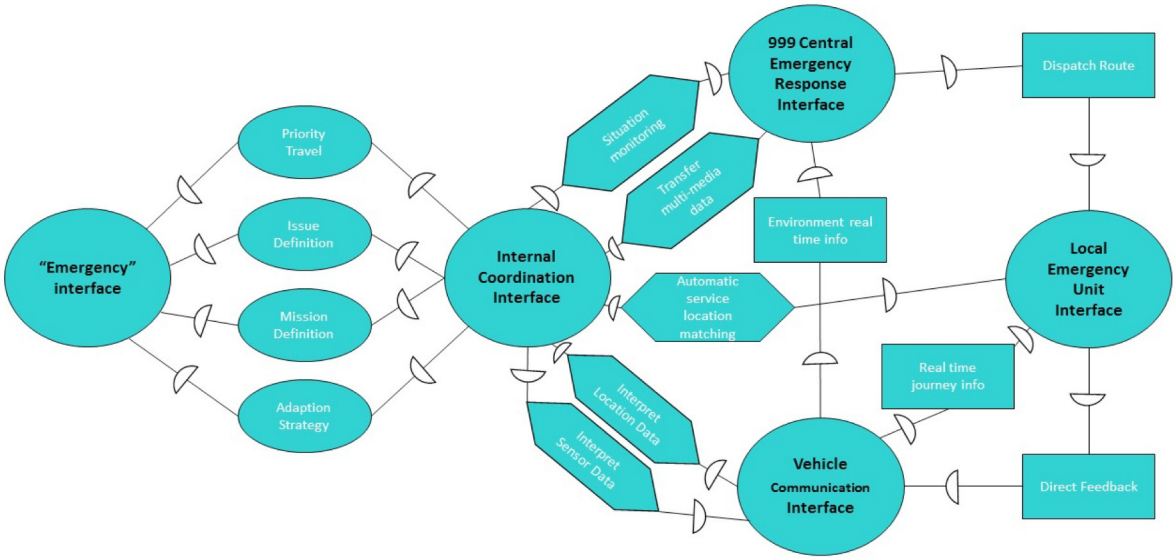

Figure 2: "Emergency" Multi-Agent Interface Structure

Figure 2 lays out the actual multi-agent structure designed for "Emergency."

Just like a joint venture, partners continuously contribute to the system through V2X networks and emergency response networks. Although "Emergency" directly handles passenger requests and represents general public's interests, partners are obligated to provide service innovations, technology upgrades, data management and service delivery tasks. Automakers are mainly responsible for developing and implementing the vehicle to vehicle (V2V) communication standards and technologies in order to accomplish priority autonomous travel. Central emergency response centers develop the next generation of 999 so they may receive multimedia messages and offer direct in-vehicle responses. Local emergency units set up their request receival terminals and take care of passengers at arrival. "Emergency" development team integrates all the subsystems and communication networks. All the organizations are given the flexibility to update and adjust their network and databases; and they also share the responsibility to push the universal software adoption.

As the implementation timeline continues to carry on, an increasing amount of assigned tasks will be automated by cognitive-intelligence agents. Participating organizations will need to take their learnings and adopt an agile strategy to meet the general public's changing needs and incorporate the technological advancements like 5G. "Emergency" might expand its service offering based on the maturity of technologies, but it will continue to control its external interface strategy and maintain the alignment of its partnership alliance.

Organizational Information Services

The previous section addresses the integration of interface agents; this section elaborates on the interactions between task agents and information agents. The interactive ICT view of computational artifact is appropriate for conceptualizing the information control process in "Emergency." At a more granular level, this part covers the aspect of information sharing among digital agents within an individual context rather than an organizational context. Through transmitting and receiving data, the system enables a set of dispersed autonomous agents to coordinate and respond to passengers' needs collectively. Unlike the existing technologies of emergency response, this artifact quickly creates new data linkages and seamlessly integrates information gathering with decision support and problem solving.

Applying Mathiassen and Sorensen's theory of organizational information services, we can further describe the interaction between human/digital task agents and informational services (2008). The system dynamically handles uncertainty and equivocality throughout different stages of service delivery. According to Pattie Maes, humans need to be able to delegate tasks to personal assistance because of limited attention span (1997). The following analysis (table 1) incorporates the automation level of each task into Mathiassen and Sorensen's framework in order to reflect the capability and suitability of autonomous agents. Information agents offer data to human/digital task agents' information requests.

The proposition for determining each automation level depends on the information that can be obtained by the system. Because the initial emergency request can be highly equivocal and highly uncertain, the passenger has the control to work with intelligent agents or human agents. While there are still certain tasks in which humans are superior to machines, such as conceptual decision making, perception and intuitive control, machines can already take on many

Task	Equivocality	Uncertainty	Service and Technology Support	Service Type	Automation Level
Obtaining information of the case of emergency *Actor: Passenger & intelligent task agent*	High	High	Passenger activates the "Emergency" service by giving command via touch screen or voice recognition embedded in the service interface. The system picks up a wide range of human movement and sound through pre-installed sensors, latest voice recognition technology and keyboard inputs. The car can perceive its environment and the emergency situation.	Collaborative	Medium
Self-identifying emergency *Actor: Passenger*	Low	Low	Passenger classifies the type of requests based on the available options on starting page of the service interface.	Computational	Low
Selecting journey destination Actor: intelligent task agent	Low	Low	"Emergency" systematically selects its travel destination depending on nearest local emergency units' capacity and the shortest travel time.	Computational	High
Distributing urgent travel requests to approaching autonomous vehicles *Actor: intelligent task agent*	Low	High	Vehicle carrying out the mission must transmit its travel plan and speed info to approaching vehicles' communication boxes. Approaching vehicles adjusts their speed and position accordingly.	Networking	High
Distributing emergency case information to corresponding local emergency unit *Actor: intelligent task agent*	Low	Low	"Emergency" contacts the relevant local emergency unit regarding the initial incident assessment and transmit instant updates on the journey status, including info such as time of arrival, current location, changes to journey, etc.	Computational	High
Assessing case *Actor: 999 center staff*	High	High	Central response center (999) staff picks up the voice/video call and ask appropriate questions to assess the situation and stabilize the passenger's emotion.	Collaborative	Low
Dispatching official vehicles *Actor: 999 center staff & intelligent task agent*	High	Low	With automatic location-service matching algorithms, center staff can allocate the response task to the nearest available official emergency vehicles. The fully autonomous emergency vehicle will rush to the scene based on center staff's assessment inputs.	Adaptive	Medium
Accepting arriving passengers *Actor: local response unit & intelligent task agent*	Low	Low	"Emergency" system will transmit the initial case information and arriving time to local emergency unit's interface. Staff at the local emergency unit is triggered by the notification of the vehicle arrival.	Computational	High

Table 1: Information Services and Automation in "Emergency"

explicit knowledge tasks and some tacit knowledge tasks (Carr, 2015; Shirner et al., 2013). A high degree of uncertainty is always embedded in most 999 related requests. In case of prank calls, humans in the system are capable of dealing with ambiguous, incomplete and wrong data (Muller, 2016). The system cannot predict the type of incident (either legitimate or illegitimate requests), but it has a mean to identify the issue reported with advanced natural language processing capability. Task 1 and task 6 show the service and technology support in these two different levels of automation. The option for contacting a human agent is a crucial feature of the system, as it encourages fearful passengers, who feel unfamiliar with technologies, to overcome their situation. The service type of both tasks are collaborative, because they involve complex user needs and long-lasting trust. If the "Emergency" system can offer the right amount of support during the early stage of service delivery, it can help users to trust and understand the later stage of service delivery.

Tasks like case identification, destination selection, and passenger acceptance process information with relatively lower level of uncertainty and equivocality; therefore, can be carried out by autonomous intelligent agents. Humans can easily understand these services, since the tasks are short encounters implemented with straightforward and standardized approaches. The autonomous vehicle is responsible for the task of distributing urgent travel information to approaching vehicles. It transmits standardized travel data to approaching cars' communication boxes to inform other cars/passengers and gain priority travel. The entire encounter process occurs within a short time span to ensure road safety. Finally, 999 center staff work with official vehicle responders by leveraging available intelligent information agents to appropriately allocate service resources. Due to multiple back and forth negotiation between the agents, this task is flexible yet complex to complete. Mathiassen and Sorensen's theory offers a comprehensive approach in untangling the responsibilities and control between the information and task agents.

Modelling Human-in-the-Loop within CPSs

Humans are in the center of this CPS, despite the usage of autonomous cars and intelligent software agents. Although CPSs like "Emergency" collect and process a lot of information about the physical environment, they do not complete tasks independently. The service does not completely free up passengers' self-care role in an emergency situation, nor does it displace the legacy 999 system. Therefore, to ensure user acceptance and adoption across a wide range of organizations, "Emergency" cannot treat passengers and emergency service partners like mindless minions. An interactive interface is required to adapt to the respective human's needs. Previous researches suggested various design frameworks to model future human-in-the-loop cyber-physical systems. Within the scope of shared control, Shirner et al. emphasizes that decision algorithms must divide governance between human and machine, so the human can make conceptual and top-level decisions and the machine can automate local realization (2013). Zhong et al. proposes a cyber-physical-social system to include human beings inside a system, and emphasizes the supplementary role of machine in aiding human observation, decisions and actions (2011). Hence, it is important to investigate how shared control methods

can be leveraged to effectively delegate tasks in direct support of humans.

This artifact realizes the augmentation of the emergency service operations through distributed cognition - cognitive processes happening outside of human brains (Norman, 1994; Hollan, 2000). To ensure users' trust in this adaptive environment, system designers should reveal parts of the "black box." As a universal public service, "Emergency" needs to make fair decisions and augment service providers' cognition in each request. From a human-centered perspective, the human perception of fairness can be generated from fairly communicated decisional processes (Toniges et al., 20116). The human user modeling framework developed by Toniges et al. is therefore chosen to be implemented in "Emergency" user interface and system design to ensure fair decisions. "Emergency" prototype exhibits all five requirements listed by the researchers. Firstly, all the interface voice and written phrases communicate in a polite and respectful way. Secondly, key decision stages provide reasons for their output actions to promote transparency. Because many decisions are made within seconds so not all data can be displayed to humans, the system is capable of aggregating various reasons and presenting the most valuable information during the key stages. Thirdly, every page of the passenger interface has a "return" or "cancel" button for the user to raise objections to the decision when they disagree. Toniges et al. mindfully raised the point that a balance between system efficiency and user wellbeing in this context (2016). Fourthly, by working with legacy 999 organizations, the system help users to understand that the response procedures are applied consistently across people and time. The public image of 999 is generally considered as bias free. Lastly, the system considers its respective user's comparison with other users. "Emergency" actively includes persons with physical and mental disabilities by offering alternative ways of communication, such as voice recognition, type box and a human call receiver. Following all criteria, the communication design decisions can bring positive impact on the shared control of this cyber-physical system.

Limitations

This paper primarily focuses on designing the human-machine coordination. With accumulated knowledge of cyber-physical system from academia, there is still a wide range of open questions related to ethical and legal concerns regarding intelligent systems: How and in what way are regulations affected by autonomous agents? Who are the data controllers? There are also questions relating to possible changes in organizations caused by the application of these systems: are supervisors still needed if digital agents are able to manage workflow and process? What kind of system modification decisions can be made by managers? Finally, physical interaction between the human and the machine remains a key research question in studying CPSs.

Many academic sources used in this paper come from the field of Computer Science, Artificial Intelligence and Robotics. The Information System field needs to engage in more debates relating to topics about human and digital agent interactions, the complexity of CPSs or the organization of distributed agents.

Conclusion

Autonomous vehicle's greatest promise is that it will buy humans the most precious resource - time. In fact, as shown in the discussion, intelligent systems seem to increase their dependency on human actions due to growing connections and autonomy in dynamic coordination. Through the understanding of interface, task and information agents, this paper concludes that services carried out by intelligent agents reshape the roles, skills and attitudes of the people who also participate in the service delivery. The design of shared control between human and digital agents will be determined not by machines but by the choices made by individuals, organizations and societies. If our choices introduce more inequity and less prosperity, humans will sooner or later resist the use of intelligent systems. After all, the study of digital agents in information systems has to extend to interdisciplinary research with a human-centered perspective.

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Closed Platforms Open Doors: Deriving Strategic Implications from the Free-Floating Car Sharing Platform DriveNow

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KEYWORDS

Open platforms
Closed platforms
Drivenow
Car-sharing
Business strategy
Platform strategy

ABSTRACT

This paper examines the free-floating car-sharing company DriveNow, governed by a joint venture of BMW Group and Sixt SE. The platform-mediated network model is used to determine DriveNow is a closed platform. Relating this to adoption/appropriability characteristics, I show how the closed nature of the platform strategically affects DriveNow.

It is concluded that DriveNow, although closed, can pursue at least three successful platform strategies, but struggles capitalizing on multi-sided network effects. The paper thus shows how a closed platform born through traditional ventures, despite growth bottlenecks, also has the potential to disrupt industries.

1. Introduction

Digital platforms are radically transforming every industry today (de Reuver, Sørensen, & Basole, 2017). The competitive edge and profit growth achieved through digital platforms indicate why so many firms are including the power of platforms into their existing business strategies (Parker, Van Alstyne, & Choudary, 2016). For some "born-digital" companies like Microsoft and Amazon, this inclusion of and diversification through platforms is easier than for traditional businesses that have relied on linear value chains for decades.

This paper focuses on firms engaging in traditional business activities and how digital platforms can benefit them. This will be examined through the theoretical lens of open versus closed platforms. The case used to exemplify and narrow the scope of the research question below is "DriveNow GmbH & Co. KG", a free-floating car-sharing company from Germany that was founded in 2011 through a partnership of BMW Group, founded in 1916 and Sixt SE, founded in 1912. The two parent companies have well-defined, traditional business models with core value-creating activities that align well with the linear value chain concept described later. DriveNow exemplifies these companies' attempt to jointly enter transportation markets currently being disrupted by platform businesses such as Uber, BlaBlaCar, and others (Parker, Van Alstyne, & Choudary, 2016). DriveNow itself, as argued here, can be considered a closed platform that does not yet fully capitalize on open multi-sided network effects.

The relevance of exploring digital platforms and researching them in the IS field has been recently emphasized by de Reuver, Sørensen, & Basole (2017). The challenges highlighted by the researchers stem from the exponentially growing scale of platform innovation, increasing complexity of architectures and the spread of digital platforms to many industries (de Reuver, Sørensen, & Basole, 2017).

The spread across industries forms the motivation for this explorative research on DriveNow – a player in the transportation and mobility industry – which has been to date overlooked in platform discussions despite its relevant developments as a digital platform. The lens of "platform openness", a core concept of digital platforms (de Reuver, Sørensen, & Basole, 2017, p. 4), is selected to analyze DriveNow. As later applied in the conceptual analysis, DriveNow's closed nature leads to strategic implications that form the basis for future research.

This paper examines the following research question:

How is the joint venture car-sharing platform DriveNow strategically affected by its closed platform characteristics?

The paper proceeds with a literature review covering three sections: (1) The advantages and successful strategies of digital platforms, (2) an overview of open and closed platforms, and (3) how to assess platform openness.

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The concepts from the literature review are then applied to the DriveNow case, which, based on secondary data, determines two things: (1) DriveNow is a closed platform, and (2) the closed nature of DriveNow has strategic implications, which are outlined in the same fashion as proposed by the platform-mediated network model introduced in the literature review. The paper closes with limitations and contributions to future research, and concluding remarks.

The methodology of this research relies on literature from prominent, peer-reviewed journals and expert authors on digital platforms to form its theoretical basis. Information related to DriveNow was collected through secondary, official company sources and analytically applied to the theoretical concepts. Together, this allows for an exploration of the research question to highlight the relevance of this case for future research on digital platforms. Because the research intention of the paper is exploratory, rather than confirmatory, this method is argued to be appropriate for the context and scope at hand (Walsham, 2006).

2. Literature Review on Digital Platforms

2.1 Advantages and Successful Strategies

Parker, Van Alstyne, & Choudary (2016) distinguish between pipeline and platform businesses. The pipeline analogy shows how traditional businesses, like automotive OEMs, create value by aligning their operations in linear chains of value creation. A pipeline describes a linear transition: from acquiring inputs at the start of the pipe, transforming them along the way, and selling the output at the end of the pipe.

Platform businesses operate under value networks – different platform participants create value, without requiring traditional resources by the platform provider. The advantages of creating and maintaining platform businesses traces back to several areas. First is the platform's potential to capitalize on network effects when catering to multi-sided markets (Parker, Van Alstyne, & Choudary, 2016). Network effects describe "the impact that the number of users of a platform has on the value created for each user" (Parker, Van Alstyne, & Choudary, 2016). These network effects, as outlined by many academics e.g. Armstrong (2006), Evans (2003) and Rochet & Tirole (2003), can create immense growth, far surpassing other growth-building tools used by traditional businesses such as price effects and brand effects (Parker, Van Alstyne, & Choudary, 2016).

Second, the platform business does not typically rely on resources, as it does not create value through supply-side resources such as machinery, human resources or capital, but through the networks of users it establishes. Parker, Van Alstyne, & Choudary (2016) describe a shift that turns traditional businesses inside-out – moving away from internal, supply-side activities and focusing on external, demand-side activities to maximize growth of a strong, value-creating network. This means a platform can create faster growth with high revenue stream potential with less commitment to owning expensive resources. This makes the platform business disruptive to some industries and attractive to many traditional businesses.

To be successful, a platform needs to employ four strategies, all of which are influenced by the degree of openness, discussed below. Most research on platforms has agreed upon four areas critical to successful platforms (Suarez & Cusumano, 2009, p. 77). A successful platform must (1) utilize pricing strategies e.g. Eisenmann (2005), (2) have a wide range of complementary products e.g. Gawer & Cusumano (2002), (3) capitalize on network effects e.g. Katz & Shapiro (1986), and (4) create technological and design advantages e.g. Suarez & Utterback (1995). These four strategies will be later examined in the DriveNow example.

2.2 Open and Closed Platforms

Varying levels of platform openness can be found in digital platforms, for instance in iOS and Android (Benlian, Hilkert, & Hess, 2015), payment platforms (Ondrus, Gannamaneni, & Lyytinen, 2015), or digital marketplaces (Ghazawneh & Henfridsson, 2015). There has been consensus among academics that choosing an adequate degree of platform openness is important for businesses that choose to create and maintain platforms (Gawer & Cusumano, 2002; West, 2003; Gawer & Henderson, 2007; Eisenmann, 2008; Parker, Van Alstyne, & Choudary, 2016). Whether a platform should be open or closed is not dichotomous. West (2003) argues that a trade-off takes place between two elements: (1) adoption and (2) appropriability. He suggests an assessment of these elements is required to determine whether a platform should lean towards open or closed characteristics.

West (2003) states an open platform leads to higher adoption. On the plus side, this allows the platform to capitalize on network effects and reduce user concerns, leading to major advantages for the platform providers (Eisenmann, Parker, & Van Alstyne, 2009). On the downside, increasing a platform's openness also leads to reduced appropriability (West, 2003), or reduced switching-costs for users and higher competition among platform providers. This in turn forms a disadvantage for platform providers and highlights the careful trade-off when deciding between an open and a closed platform (Eisenmann, Parker, & Van Alstyne, 2009).

But how can platform business creators and maintainers assess whether their platform should be open or closed according to the above strategies? Eisenmann, Parker, & Van Alstyne (2009) argue that the answer lies within the exchanges of platform participants and the role of underlying platform components and rules. The next section covers the "platform-mediated network" (Eisenmann, Parker, & Van Alstyne, 2009), which serves as a suitable model to chronologically discuss a platform's openness. The model will be used to exemplify the DriveNow case

in section three and determine both its platform state (open/closed) and, based on the review above, outline strategy implications for the platform.

2.3 Assessing Platform Openness: The Platform-mediated Network

Traditional businesses that employ linear value creation, i.e. "purchase inputs, transform them, and sell output" (Eisenmann, Parker, & Van Alstyne, 2009) are different from exchanges in platform-mediated networks. Instead of linear value creation, the model of platform-mediated networks depicts triangular exchanges between different participants of the platform. The elements of this triangular platform-mediated network are (1) demand-side users ("end users"), (2) supply-side users, (3) platform providers, and (4) platform sponsors. Points one to three form a triangulation among demand users, supply users, and the platform itself. Platform providers serve as the point of contact for underlying components, rules, and architectures that form the foundation of the platform. Platform sponsors design and hold intellectual property rights for the components, rules, and ecosystem of the platform. Platform sponsor and provider roles can be filled by one or many companies.

See Figure 1 below for an illustration of the platform-mediated network, adapted from Eisenmann, Parker, & Van Alstyne (2009), which incorporates platform research from a wide range of academics (Rochet & Tirole, 2003; Schmalensee & Evans, 2007; Boudreau, 2008; Baldwin & Clark, 2000).

Beyond visualizing network effects, the application of a platform-mediated network to a platform business and assessing its participants constitutes a method that has been used to determine platform openness (Eisenmann, Parker, & Van Alstyne, 2009, p. 133). The concept of digital platform openness constitutes looking beyond organizational arrangements and including technologies like APIs and software development kits (de Reuver, Sørensen, & Basole, 2017). However, because no primary data was collected for this case, the platform-mediated network best allows for systematic analysis of those areas that can be examined with secondary, available data on the company.

In section three, the engagement of participants within DriveNow's platform-mediated network will be examined to determine individual degrees of openness and derive strategic implications. A platform can be seen as open when no restrictions are placed on its use and development by platform participants (Eisenmann, Parker, & Van Alstyne, 2009, p. 131).

3. Conceptual Analysis of DriveNow

3.1 Background: DriveNow and its Core Interaction

Car-sharing services have emerged within the sharing economy as a type of corporate sharing that adheres to cost reductions for using cars, environmental and traffic concerns (Shaheen, Cohen, & Chung, 2009). DriveNow is one of these services. It was founded in 2011 and began its operation in Munich and Berlin. Founded by both automotive manufacturer BMW Group and car-rental service Sixt, each with 50% stakes in the joint venture, customers of DriveNow can flexibly book BMWs/MINIs found near them through a mobile application and return them anywhere in the designated business area. Membership requires a one-time fee and a valid driver's license. The revenue model is based on pay-per-minute use of the vehicle, which is extended with additional revenue streams like in-car services (insurance), minute packages, and fees for parking outside the business area. With 800.000 customers worldwide, DriveNow has been operating profitably since 2014 (DriveNow GmbH &

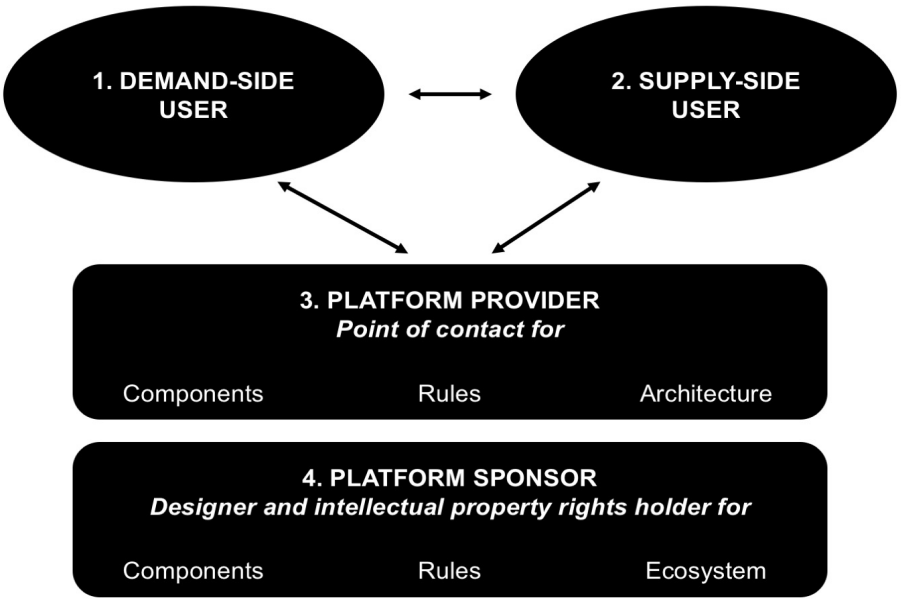

Figure 1. Platform-mediated Network. Adapted from Eisenmann, Parker, & Van Alstyne (2009).

Co. KG, 2017). A detailed profile of DriveNow can be found in Appendix A.

The core interaction (Parker, Van Alstyne, & Choudary, 2016) of the DriveNow platform is among the DriveNow customers, who pay per minute to rent cars of the DriveNow fleet; BMW and Sixt (and other partners), who provide vehicles and rental expertise respectively to the customers through the platform; rentable fleets of vehicles on the road as the primary value unit to the DriveNow platform; and location- and vehicle-based filters to enable intelligent rental recommendations to DriveNow customers (e.g. closest automatic vehicle to customer's location).

DriveNow differs from multi-sided platform services such as Uber because it is corporate-enabled, rather than private-enabled, and it does employ resources (Kindel, Kobbe, Mertens, & Munzinger, 2015). DriveNow relies on a combined network of corporations (BMW, Sixt and other partners) to operate its service, compared to Uber, which relies on a network of both private drivers and riders to operate its platform. Even though its backbone is corporate, DriveNow can be applied to the platform-mediated network outlined in section 2.3 to determine platform participants and platform openness.

3.2 Platform-mediated Network as Applied to DriveNow

Using Eisenmann, Parker, & Van Alstyne's (2009, p. 136) model for organizing platforms, DriveNow is an example of a joint venture platform: a singular provider of a platform (DriveNow) owned by two platform sponsors (BMW Group, 50% and Sixt, 50%). The two companies will be referred to as the "joint venture firms".

A visualization of the DriveNow platform-mediated network can be seen in Figure 2 below. The information was retrieved from official DriveNow sources (DriveNow GmbH & Co. KG, 2017) and applied to the model of Eisenmann, Parker, & Van Alstyne (2009). A detailed description of this platform-mediated network can be found in Appendix B.

From Figure 2, we can move to section 3.3 and assess the openness of the DriveNow platform, which chronologically depicts the degree of openness of the individual participants to engage with the platform. The degree of engagement is not supported empirically, but will be explored qualitatively in line with the model's application of Eisenmann, Parker, & Van Alstyne (2009, p. 133).

3.3 Analysis of Platform Openness

Moving chronologically through Figure 2, *demand-side users* (1) can openly engage with the DriveNow platform if they are paying customers, fulfilling certain legal criteria such as owning a valid driver's license and not having a criminal record. DriveNow can be used natively on most smartphones (iOS/Android), and can be accessed via the DriveNow website, meaning entry restrictions to customers is mostly limited to the up-front membership cost and legal requirement. Beyond using the platform to rent available DriveNow vehicles, a customer can also contribute to the platform in three ways: (1) Direct contribution, in which customers encode information within the vehicle about its state and transmit this to DriveNow. (2) Indirect contribution, in which customers provide information indirectly through the distance and time they drive, and start- and end-points of the vehicle. (3) Customer-to-customer contribution; DriveNow has recently introduced a new method

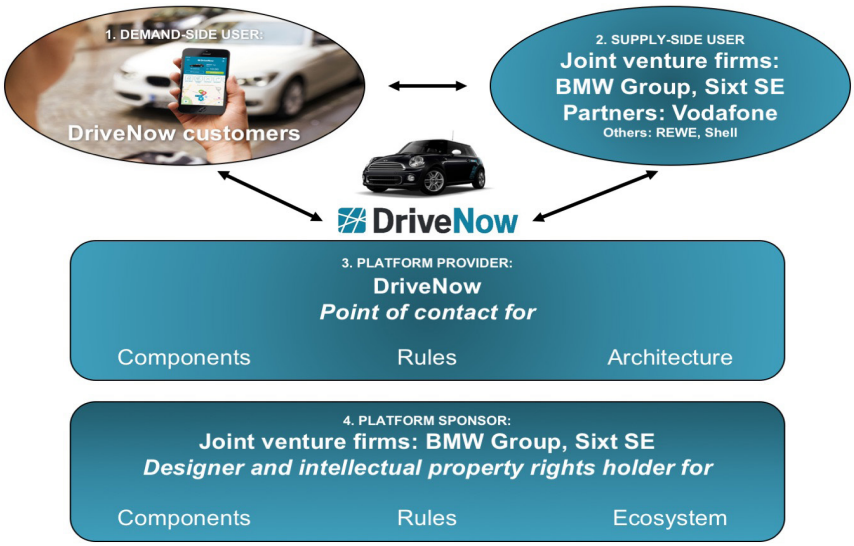

Figure 2. DriveNow's Platform-mediated Network. Adapted from Eisenmann, Parker, & Van Alstyne (2009). Images from DriveNow GmbH & Co. KG (2017).

called "hand-off", in which customers can drive the vehicle to a certain location and hand the vehicle over directly to the next customer (DriveNow GmbH & Co. KG, 2017). These three elements, along with near-frictionless entry methods for customers, make the interaction of demand-side users with DriveNow open.

Supply-side users (2) broadly include the joint venture firms, essential partners and other contributors. The supply-side is a lot more closed than the demand-side because the platform is operated under the joint venture firms, who to date have regulated tightly who uses the DriveNow platform on supply-side. So far, supply-side users have been limited to one essential partner, Vodafone, providing the essential networking infrastructure for DriveNow to move its data traffic to provide automatic billing by logging vehicle unlocks, and vehicle driving distance and time to the platform. Additional supply-side users have been added gradually for strategic purposes, such as gas stations to provide users with free minutes when filling up vehicles, and grocery stores to provide promotional incentives to use a DriveNow vehicle to shop at respective stores. Because of this extremely limited usage of DriveNow on supply-side, it can be classified as closed, with exceptions to those few permitted to use the platform.

The *platform provider* (3), DriveNow, is pursuing the strategy of combining the valuable resources and expertise of its sponsor firms to create a strategic advantage over other platforms, thus not opening its platform to outsiders. Arguably, Vodafone's infrastructure is enabled at the architectural level, but as a hired contract, they are not integral to the platform itself and do not own a stake. Thus no other complementors are allowed at this level of the platform-mediated network, meaning the platform provider itself is closed.

Finally, the *platform sponsors* (4) are closed due to their business objectives and extensive cost structures established over the years. Breaking this down, BMW Group has tight patents on its vehicles and vehicle technologies, whereas Sixt has tight control on its rental expertise and network. The firms share resources with each other to create a strategic advantage for the DriveNow platform, but so far have not been incentivized to further share their resources with additional sponsors, and have not opened their resources up to outsiders to not lose their competitive positioning. BMW Group sells cars, whereas Sixt provides car rentals, so sharing their resources with other sponsors would threaten their core businesses. This means at the sponsor level, the platform is closed, and particularly complex due to individual business objectives of the joint venture "sponsor" firms.

Summarizing, three sides of DriveNow's platform-mediated network can be classified as closed, with restrictions on platform development and participation/use, whereas one side, that of the demand-side user, can be classified as open. This means the majority of the DriveNow platform, from a participant perspective, is closed. The implications of this for strategy will be discussed in 3.4.

3.4 Strategic Implications

As outlined in the literature review, West (2003) argues that a trade-off takes place between two elements: (1) adoption and (2) appropriability, and that an open platform leans towards adoption, whereas a closed platform leans towards appropriability. Cross-referencing this with successful platform strategies (Suarez & Cusumano, 2009, p. 77), (1) pricing strategies, (2) complementary products, (3) network effects, and (4) technological and design advantages, we can infer the following strategic implications:

One side of the DriveNow platform-mediated network is open. The openness of the *demand-side user* (1) may lead to higher adoption (West, 2003). Arguably, the switching-costs for users in this case are higher as platform participation comes with a cost and time investment (driver's license verification), which offers DriveNow the ability to utilize pricing strategies (Eisenmann, 2005) to cater to these potential platform adopters. High adoption also leads to reduced user concerns, which DriveNow can exploit to drive growth.

Most other sides of the DriveNow platform are however closed, for instance the closed *supply-side user* (2), which contributes to high appropriability (West, 2003). This leads to strategic advantages DriveNow can exploit, such as stability and predictability of the supply-side and more controlled, cost-effective resource allocation to cater to demand, which means DriveNow avoids the "chicken and egg" that burdens multi-sided platforms (Parker, Van Alstyne, & Choudary, 2016). However, it also leads to disadvantages over more open platforms at this level. DriveNow loses out on the potential to capitalize on multi-sided network effects (Katz & Shapiro, 1986), which means it cannot grow as quickly as a competitor such as Uber. This is indicated by the 800.000 customers DriveNow has acquired to date, compared to Uber's 40 million monthly users (Kokalitcheva, 2016). DriveNow must focus on building its demand-side user base with more traditional growth strategies to increase overall platform growth, and rely on more controlled complementary products and services on supply-side (Gawer & Cusumano, 2002).

Finally, the *platform provider* (3), and *platform sponsor* (4) are closed and offer a proprietary advantage to create competitive technological and design advantages through high appropriability. DriveNow faces the challenge to balance this competitive technological and design advantage with slow market responsiveness. It must utilize the competitive, combinatory strength of its platform sponsors, while not losing out to first-mover advantages of industry competitors. Additionally, it is much harder for DriveNow to flexibly adapt its core value unit due to the deeply ingrained expertise of its parent firms, whereas Uber can more quickly implement complementary services such as "UberEats". Thus, DriveNow must continuously find ways to capitalize on the expertise of its sponsors while minimizing bureaucratic friction.

A summary of the discussed strategic implications can be derived from Table 1.

4. Limitations and Contribution to Future Research

This paper has examined strategic implications for DriveNow under multiple theoretical lenses and positions, forming a myriad of limitations due a unique combination of concepts and theories. The platform-mediated network, in this paper, has only been employed on a broad level, and more technical, insider insight into DriveNow would be required to understand the interplay and ownership of platform rules, components and architectures. The open versus closed dichotomy was based on research from West (2003), which takes a more open-source software perspective than that of a free-floating car-sharing platform.

However, I believe this combination addresses the research question adequately on a broad level. The secondary data from this case sheds light on the interplay of open and closed characteristics, and their implications for strategy, which has not yet been researched for a joint venture platform like DriveNow. Future research could use this as a stepping stone to go into more technical and quantitative detail in each element of the platform-mediated network, and empirically examine the complexities of running joint venture platforms as outlined here.

Linking back to the concepts outlined in the literature review, the findings from the analysis agree with the research that choosing an adequate degree of platform openness is important for platform businesses (Gawer & Cusumano, 2002; West, 2003; Gawer & Henderson, 2007; Eisenmann, 2008; Parker, Van Alstyne, & Choudary, 2016). The findings also suggest that a careful balance between open and closed characteristics is required (West, 2003), because this balance has strategic implications for the business.

The level of analysis employed here provides a new example in how traditional businesses use a closed platform to their advantage. Responding to the call for digital platform research across industries (de Reuver, Sørensen, & Basole, 2017), businesses from traditional industries moving to platform businesses should be included in future research. That way, patterns could be identified to determine whether having a traditional business model warrants platform closure to capitalize on strategic advantages over competitors, as was the case with DriveNow.

5. Conclusion

Answering the research question, the closed nature of most DriveNow platform participants results in strategic implications characterized by high appropriability. This creates advantages for DriveNow to pursue at least three of the four strategies for successful platforms presented by various academics. These are (1) Pricing strategies, (2) Complementary products and services, and (3) Design and technology advantages. These are respectively challenged by market responsiveness and the ability of the sponsor firms, BMW Group and Sixt, to find mutual agreement.

However, running profitably for its third year, the utilization of these three platform strategies seems to have been successful, returning the investments to its platform sponsors. The fourth strategy DriveNow is challenged by, and most vital strategy for growth, is that of multi-sided network effects. DriveNow, because it is closed, can only achieve growth of the platform on the demand side. Even though this entails advantages, such as no "chicken and egg" problem and controllable supply-side stability, it limits the growth the platform can achieve compared to competitors utilizing multi-sided strategies.

As this case has shown, DriveNow struggles to capitalize on multi-sided network effects, but thrives through other strategic advantages mostly enabled by its sponsor firms. Thus, this paper has exemplified how a closed platform, even without multi-sided network effects, can give back to traditional businesses by augmenting existing resources and using a platform to diversify strategically. It is exciting to see closed platforms born out of traditional ventures open new doors and strategic alternatives for industry disruption.

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Platform participant	Open/ Closed	Reasoning	Strategic Implications

1. Demand-side user: DriveNow customers	***Open***	***Frictionless entry***
		• Demand-side users can openly engage with the DriveNow platform if they are paying customers, fulfilling certain legal criteria (no restriction of use)
		• DriveNow can be used natively on most smartphones (iOS/Android) and its website
		Platform contribution
		• Customers can contribute to DriveNow in three ways:
		  ○ Direct
		  ○ Indirect
		  ○ Customer-to-customer
			High adoption (West, 2003)
			Opportunities:
			• Higher switching cost; potential to utilize pricing strategies (Eisenmann, 2005)
			• Reduced user concerns (Eisenmann, Parker, & Van Alstyne, 2009)
			Challenges:
			• Strong network effects on only one side and high dynamism (Katz & Shapiro, 1986)
			• Limited demand-side predictability

2. Supply-side user: BMW Group, Sixt SE, Vodafone, Others (see Appendix A)	***Closed***	***Limited and restricted supply-side users*** • Supply-side users are limited to the joint venture firms, BMW Group and Sixt SE, as well as partner corporations selected by the joint venture firms, such as Vodafone • Because no other supply-side users are allowed to participate in the DriveNow platform, the classification is rather closed than open	***High appropriability*** (West, 2003) Opportunities: • Stability and predictability of supply-side; strategic resource allocation • No "chicken and egg" problem (Parker, Van Alstyne, & Choudary, 2016) • Controlled complementary products and services (Gawer & Cusumano, 2002) Challenges: • Capitalizing on multi-sided network effects; i.e. Platform growth (Katz & Shapiro, 1986) • Tight regulation of complementary products (Gawer & Cusumano, 2002)
3. Platform provider: DriveNow	***Closed***	***Platform governance solely by joint venture firms*** • Only BMW Group and Sixt SE have a legal say over the DriveNow platform and no other complementors are enabled at this level, with exception to Vodafone • Because of this, the platform is closed on the platform provider level	***High appropriability*** (West, 2003) Opportunities: • Design and technological advantages (Suarez & Utterback, 1995) through combinatory expertise of platform sponsor Challenges: • Market responsiveness due to shared resources and focus on core business; difficult to penetrate other industries
4. Platform sponsor: BMW Group, Sixt SE	***Closed***	***Strong intellectual property protection by joint venture firms*** • The tight coupling of BMW Group and Sixt SE governing the DriveNow design and intellectual property make the platform sponsorship closed • Each company has own intellectual property (IP) they bring to the platform; e.g. BMW has its patented technologies it brings to DriveNow • The complexity to open the platform at this level is high due to the numerous amounts of IP and clashing business objectives of the joint venture firms	***High appropriability*** (West, 2003) Opportunities • Design and technological advantages (Suarez & Utterback, 1995) through combinatory expertise of platform sponsors Challenges: • Market responsiveness due to bureaucratic friction • Difficulties inverting the two firms (Parker, Van Alstyne, & Choudary, 2016) due to individual business objectives

Table 1. Summary of Case and Strategic Implications.

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Appendix A: DriveNow Company Profile

Official company description: "DriveNow, the carsharing joint venture of the BMW Group and Sixt SE, is available in various European cities and offers a range of high-quality premium vehicles of the BMW and MINI brands to rent, based on the free-floating principle. The vehicles can be hired and returned independent of location within a defined business area. More than 800,000 registered customers find and reserve vehicles using the DriveNow App or website, and are able to use the service across multiple cities." (DriveNow GmbH & Co. KG, 2017)

Company structure: Joint venture; 50/50 BMW Group and Sixt SE

Established: May 2011

Concept: One-way car-sharing

Headquarters: Munich

Number of customers: 800k+ customers

Pricing model: Minute-based rates. Fuel costs, parking, insurance and car tax are all included. Savings and Hourly Packages allow a further reduction of rates per minute

Payment options: Debit or credit card

Vehicles: BMW and MINI models, depending on country. Copenhagen only consists of electric BMWs

Total number of vehicles on road: 5510 (860 of which are electric, roughly 16%)

Cities (number of vehicles): Munich (700), Berlin (1300), Dusseldorf and Cologne (620), Hamburg (580), Vienna (500), London (310), Copenhagen (400), Stockholm (300), Brussels (300), Milan (500)

(DriveNow GmbH & Co. KG, 2017)

Appendix B: DriveNow Platform Participants

The platform-mediated network of DriveNow incorporates:

1. DriveNow customers, as its demand-side users

2. Partnerships of corporations, as its supply-side users, including:

    o BMW Group (Joint venture firm, 50% stake): Providing the vehicles and vehicle technology to the platform

    o Sixt SE (Joint venture firm, 50% stake): Providing the rental expertise, the premium services, the IT systems, and customer registration network to the platform

    o Vodafone (Partner): Providing the networking infrastructure for DriveNow to move its data traffic to provide automatic billing by logging vehicle unlocks, and vehicle driving distance and time to the platform

    o Others (not essential to the successful operation of DriveNow):

        - Gas Stations: Providing infrastructure for customers to fill up vehicles and receive free minutes in return (e.g. Shell)

        - Sponsored Partners: Cooperations with grocery stores (e.g. REWE) to offer discounts when taking a DriveNow car to shop at the respective store

3. The "DriveNow" platform as the focal platform provider, providing the point of contact for users of both sides concerning:

    a. Components

    b. Rules

    c. Architecture

4. BMW Group and Sixt SE as the platform sponsors, holding the intellectual property rights and responsible for the platform design of:

    a. Components

    b. Rules

    c. Ecosystem

Information retrieved from DriveNow GmbH & Co. KG (2017) and Vodafone (2017)

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VRM a technology of domination of self - The effects of vendor relationship management systems as tools for consumer empowerment

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KEYWORDS

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ABSTRACT

This research paper studies how VRM (vendor relationship management) systems, as tools for marketing and consumption practices, can affect aspects of consumer empowerment. I conclude that while better consumer producer relationships can be fostered the dangers of techno-plebiscitarianism and increased disciplining can affect wider parts of society. The theoretical framework relies on a combination of the Foucauldian notion of governmentality and Kasabov's narratives of consumer dissatisfaction. Through recognizing the effects of discourses of knowledge, choice and power on narratives of information inequities and disciplining I establish a basis for understanding consumer empowerment through VRM systems for marketing and consumption practices.

Introduction

"The house always wins" - Danny Ocean, Oceans 11, 2001.

Narratives of consumer dissatisfaction cannot be dissociated from the discourses of knowledge, choice and power. Modern information systems, such as social media networks, are already affecting discourses of knowledge and truth. The Internet has allowed consumers to enact more control over many aspects of their lives. But to what extent is individual subjectivity being formed by existing structures beyond their control? Discourses of knowledge, choice and power will inevitably be altered through VRM systems, causing spillover effects to society. Breaking down consumer empowerment into the two levels of analysis has helped to understand the concerns with VRM systems that lie ahead.

VRM systems, aim to provide consumers with two functions: firstly, independence from vendors and secondly, better ways to engage with them. Customers would have more autonomy and agency to act on their data making just about every service customizable. In 2017 a VRM system was created to reengineer business processes in isolated areas of Hawaii (Augustin and Albritton 2017). Their research found that these technologies allowed vendors and consumer to focus on what they do best, but they did not bring about a significant increase in revenue. The tailored technology enabled vendors, who were once isolated, to enter a customized market. Augustin and Albritton (2017) were able to show the benefits of using such technologies for business growth, but there has been very little research aimed at understanding the power effects of individualized technologies on society. This essay intends to shed light on the consequences of VRM services for consumer empowerment and advertising.

The Foucauldian concept of governmentality (1988) becomes increasingly relevant in the field of consumer empowerment. The techniques, technologies of domination and technologies of self, reveal defining attributes to this analysis, which seeks to provide a marketing narrative associated with already existing information inequities and disciplining. I suggest how these narratives evolve as a consequence of empowered consumers through VRM systems. These consequences are defined as techno-plebiscitarianism (Gerbaudo in Trottier and Fuchs, 2015) and also the reverse, where the few control the many. For marketing and consumption purposes both techniques of self and domination are present online and can therefore generate unintended consequences. For some societies, the increase in online activity has meant the spread of globalization and a post-industrial worldview that increasingly fits more traditional views of power. Mark Poster (1995) believed that electronic communications enhance significantly our postmodern potentialities by

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allowing us new relations between human and machine, greater decentralization, a new space-time complex and the obliteration of racism, sexism and homophobia – in a sense the development of a reconstituted identity through cyberspace. For Heather Menzies (2006) this meant that the restructuring effects of the Internet create new sets of inequalities that marginalize and displace workers. She fears that the forces of globalization are stimulating new social arrangements that encourage a further concentration of corporate power and increased consumer visibility (Mehta and Darier 1998, p. 109). Certain societies do not necessarily benefit from increased consumer control or personalization online (Fuchs 2014). If, as Campbell (2004) suggests, personal ontology relies on acts of consumption, then we discover ourselves by exposure to consumables and through acts of consumption. Online power structures form consumers and producers alike. The dual formation of actors fits the logics of governmentality and consumer empowerment that when acted on can enhance certain divides. I argue firstly that information inequities can be generated between actors in three ways :(1) Consumers/consumers (2) Producer/producer (3) Producer/Consumer. Secondly, these knowledge divides can increase narratives of discipline, both from consumer to producer and vice versa. When used for marketing and consumption purposes, VRM systems could facilitate the rise of disciplining and structuring of human behavior. To support this argument the notion of governmentality will firstly be contrasted with the concept of consumer empowerment to draw parallels. The essay then places consumer empowerment within the context of marketing, utilizing Kasabov's narratives as a framework for analysis. Structures of power, knowledge and choice are affected through this narrative and must then be placed within the context of VRM use.

Governmentality and consumer empowerment

Mayhew (2004) has divided the definition of governmentality as: the way governments try to produce the citizen best suited to fulfill those governments' policies. It is the establishment of organized practices (mentalities, rationalities, and techniques) through which subjects are governed. The components of this notion are: centralization around the government; an intensification of the effects of power at the levels of both the entire population and the individual; and, the emergence of new forms of knowledge useful for the implementation of the centralization/ intensification components (Mehta and Darier 1998, 109). In effect, the role of governmentality becomes central in the successful disciplining of the subject (Rose 1998, 1999). So, if to govern is to structure the possible field of actions of others (Foucault 1982, 221), then in the case of the Internet the power structures are produced in three ways: using instrumental technology, constructing reality and shaping human subjectivity (Mehta and Darier 1998, 111).

Our economies increasingly rely on information trade-offs to facilitate day-to-day activities, allowing citizens to self-govern themselves within available choices, while facilitating and encouraging choices to be made. A paradox emerges: not only are consumers expected to choose, but they are also forced to choose in order to be "free" (Rose 1999). Because governmentality occurs between eternal domination and self-government (Shankar, Cherrier and Canniford 2006 1017), parallels can be drawn with consumer empowerment. Consumers are free to choose amongst the choices made available by using techniques of technologies of domination and technologies of self: where discipline and liberation become two sides of the same coin (Shankar, Cherrier and Canniford 2006, 1020). Each implies certain modes of disciplining and modification of individuals, not only in the obvious sense of acquiring certain skills but also attitudes (Foucault 1988). The information highway is no different; both effects of domination and liberation exist simultaneously in online marketing practices. On one hand, database marketing offers the perfect tool for isolation, specification, and transformation of the subject. Certain practices such as profiling, targeting, DR, CRM are disciplinary mechanisms that can be regarded as transforming a heterogeneous mass of people into more homogenous segments. The market forces then shape an individual's sense of personal empowerment and how this flows into consumption practice (Henry 2005). Current online marketing practices have led to certain forms of resistance due to their level of intrusion and data collection. The rise of ad blocking software, namely Adblocker, can be seen as a form of resistance as it provides the consumer with increased privacy and control of their data and user journey.

So, a shift in the use of technologies for consumption will affect already existing power structures and consumer behavior. If, knowing oneself becomes the object of the quest of concern for self (Foucault 1988, 26) and subjects discover themselves through acts of consumption (Campbell 2004), then technologies for consumption emphasize these socially constructed mechanisms through which people understand and experience themselves as subjects (Shankar, Cherrier and Canniford 2006, 1019). In other words, online consumption now constitutes a prime technique of governmentality whereby people are taught and

learn how to be consumers by developing greater self-knowledge within the available options. On the other hand, authors Shankar, Cherrier and Canniford (2006, 1021) argue that empowerment involves the withdrawal from relations that construct people as consumers.

Through the use of VRM systems consumers do not withdraw but choose to be engaged with brands, emphasizing the constant state between self-discipline and domination online. Other factors, such as subjective dissonances with corporate entities, could cause consumer passiveness increasing the trend in in lack of engagement with brands. Marketing narratives of consumer dissatisfaction (Kasabov) then, shed light on how consumers could react to the use of VRM systems. Consumer subjectivities are produced through discourses of knowledge, choice and power, which are also necessary to sustain their empowerment.

Kasabov's marketing narratives

While these narratives were evaluated in small-scale physical environments, as opposed to online, there are still visible parallels that can be applied to the virtual world. Kasabov (2004, 6-7), following Foucauldian concepts (1975, 1988), explains how power is enacted between consumers and producers to create contextualized narratives. For the purpose of my argument I focus on Kasabov's latter two narratives. Information inequities occur when providers possess superior knowledge about consumers. This dissatisfaction is concerned with the transparency of such providers in processing and accumulating data beyond consumer's knowledge. Disciplining, reflects a historical shift in the refinement of instruments of observation, inspection, and controlling that are becoming the norm of modern society. The discourses present in online marketing and consumption practices help understand how the Internet has allowed for modern power structures to be produced. The aim of which is to construct reality and shape human subjectivity through the use of instrumental technologies (Mehta and Darier 1998, 111).

Discourses of knowledge, choice and power

Tracking online behaviors and targeting consumers form the basis of modern marketing techniques. In Foucault's (1979, 201) perspective this could create a "state of consciousness and permanent visibility that assures the automatic functioning of power". The practices mentioned above, can disprove our accepted beliefs that the Internet offers unparalleled access to information (Harrison, Waite and Hunter 2006, 987). While information is key to empowerment, algorithms and inferences limit what is knowable by dictating what is displayed online. Those who have less knowledge of technological practices and capabilities will see inequalities increase against their favor. For consumers there are implications to not being fully informed. Ultimately, it can affect their choices and overall well-being. Due to consumers' limited knowledge of institutions, individuals can have a limited impact on institutional dynamics (Kasabov 2004, 9). An individual's governmentality must be understood through the historical and social contextualization of their experiences. It becomes important to question whether the construction of human reality and subjectivity through instrumental technology could be at odds with the concept of consumer empowerment.

Technological innovation is not neutral but takes place within the context of existing power relations. In this sense, choices are shaped in order to offer advantage to specific groups, individuals or institutions that have more knowledge of online usage. If technologies are limiting what we know then, how relevant is "the power to exercise choice" for consumer empowerment? The spread of capitalism has created greater choice among competitors. As the unparalleled access to information online leads to practically unlimited choices, Jenner (1994) suggest that this increases consumer power. However, there has been little to support that the increase in choice has led to greater consumer emancipation. Researchers Shankar, Chérrier and Canniford (2006) questioned whether consumers benefit from more choice. They found that, choice or the freedom to choose is, a double edged sword that can be empowering and liberating, while also chaotic and paralyzing (Schwartz 1994, 2000, 2004). In many cases the cost of processing information can outweigh the benefits. Having control of choices to be made is important to the psychological well being of consumers. But, unlimited choice can produce genuine suffering (Schwartz, 2005, 201- 4) and a sense of claustrophobia (Ohm, and Peppet 2016). Then, can the majority of consumers feel more empowered within these structures?

Dominant neoclassical economics and neoliberalism go hand in hand to make the case to relocate power to the individual (Friedman and Friedman 1962, 1980). This was based on the assumption that consumers seek to maximize their quality of life by seeking to optimize the worth of their existence to themselves. Consumers in this perspective can be regarded as rational utility maximizers, assuming that consumers know what they want.. This modernist axiom of rationality allows consumers to decide who they are and what they want (Slater 1997, 37). However author Willmott (1999) critiques

this theory on two premises: firstly the rational theory approach doesn't hold when a decision is an emotional one (Elliott 1998), and secondly because, at best, there can be an inadequate acknowledgement of asymmetrical relations of power between consumers (Shankar, Cherrier, and Canniford 2006, 1015). In other words, the market will favor those with greater choice, increasing already existing inequalities of knowledge and power.

Corporations have often understood that giving back to the consumer can encourage loyalty and increased ROI. Branding and customizing techniques have served the purpose of creating another avenue of power emanating from the consumer to the producer. Engaging in this exchange of data increases the fluidity of the consumer/producer power relationship but it also increases the asymmetric power of normalization. Shankar, Cherrier and Canniford (2006, 1016) note that this power is not acting on subjects but forming them by limiting and defining what is knowable. They suggest that the role of power in creating social practices and form a discourse in modern societies, rests upon the use of technologies – that is physics and material practices with transformative functions (Shankar, Cherrier and Canniford 2006, 1017). These technologies alter a consumer's self-perception, conduct, and modes of thinking as they construct these discourses through the constant creation of online data. Not only do these describe consumer behavior, but they also prescribe it to the point of influencing those behaviors.

Kasabov's marketing narratives of consumer dissatisfaction (2004) serve as a helpful premise for understanding the development of knowledge, power and choice online. By contextualizing the purposes of the technologies their unintended consequences can become clearer. What is the correct balance of these structures of empowerment and who do they ultimately benefit?

Consumer narratives of VRM systems

The Internet creates an interesting dynamic between a variety of forces in which new power configurations and communicating individuals exist (Mehta and Darier 1998, 114). In the following analysis I attempt to unpack the possible consequences of increased consumer power through VRM systems on narratives of information inequities and disciplining. I will outline the information inequities and disciplining narratives can be present between consumers and producers affecting society and consumer behavior. I conclude that the implementation of VRM systems for marketing and consumption purposes can encourage ways of establishing better relationships with consumers. For this reason, it is important to remain optimistic about this technology. With that said, consumer empowerment can only take place within systems that permit control over available choices. Because choices are defined by technologies, and technology is never neutral, techniques of technologies of domination and self, can take place. In 1999 Nick Rose argued that the management of the self had become central to organizations and government and in this way technologies of self can be viewed as internalized extensions of a dominant disciplinary power (Shankar, Cherrier and Canniford 2006, 1025). Marketers have, throughout history made extensive use of disciplining. The permanent visibility of social information induces institutions to devise ever more ingenious ways of carrying out this 'big project' of data accumulation, monitoring and normalization (Kasabov 2004, 9). The use of VRM systems for marketing and consumption purposes could be used for resistance, but it can also lead to the creation of two narratives that cannot be understood without each other.

Firstly, VRM systems can constitute technologies of exclusion through the increased risk of information inequities. This occurs at 3 levels between actors: (1) Consumers/consumers, when access, predisposition and knowledge of information systems affect consumer's ability to maximize their utility and define themselves online. For many, this creates a divide between different factions of society. Activities related to shaping the future of the Internet rests in the hands of technologically savvy. Those who have not been formed by the acts of online consumption will face greater disadvantage, as choices will not be structured in their interest. The available consumer data can be structured to alter these individuals in more ways than one. (2) Producer/Consumer, use of personalization techniques and algorithmic structure could reduce knowledge or willingness of consumers to engage with brands that are not iconic or well known. The spread of globalization can cause reduced knowledge of smaller, independent and local brands. A large number of consumers could engage in a form of techno-plebiscitarianism, reducing overall brand competition online. (3) Producer/producer inequities occur as a result of the first divide. Personalized platforms could reduce online engagement with smaller brands affecting smaller providers' ability to compete in the market. Simultaneously, the formation of corporate partnerships can establish penalties based on the correlation of behaviors that can bring about consequences such as the "khaki speculation " (see Ohm, and Peppet 2016). Therefore, a paradox is present: empowering more consumers can

disempower other actors through the creation of information inequities.

Secondly, these information inequities can affect provider's ability to affect what users see and know disciplining users in the process. If consumers begin to rely more on fewer companies for their online activities, the accumulation of this data could lead to more subtle forms of surveillance and also of disciplining. For consumers the normalization process would occur in two ways: (1) increased dependency on fewer brands, could mean that customers might find that in certain situations they will be disciplined into providing more sensitive information to vendors in order to consume a product. Corporations could form partnerships to establish a better understanding of consumer behavior in order to legitimize the cost of certain premiums based on inferences. (2) Reduced choice could shift power to producers who would dictate the look, feel and quality of products. If consumers define themselves through acts of consumption, but what they consume is defined by a brand that is normalizing its audience, what could be adverse effects on the subject's psychological well-being? The powerlessness of the consumer in situations where the producers have highly valued knowledge, technical and specialized skills, can be of concern.

VRM systems also affect the consumers' disciplining power. Their passivity to engage with marketing tactics could have implications for several brands that rely on marketing promotions for increased awareness. The customers, by having increased control over their data, can normalize the producer through negotiations to mutual advantage. Producers will have to learn how to engage in negotiation processes where they no longer have control over specific information. While this could push producers to find better ways of engaging with consumers it begs the question of whether consumers will want to engage to begin with. In a world where Adblocker penetration is increasing, and faith in the media and large corporations is dwindling, it seems unlikely that control over one's data will be incentive enough for consumers to engage with marketing or purchasing tactics on VRM systems. Consumers' increased control over their bargaining power could lead emancipation from marketing practices altogether having implications for marketing and advertising industries across the globe.

The opportunities to redress power imbalances and increase the bargaining power of consumers are several through VRM systems. Therefore, the empowerment of consumers through VRM systems can lead to techniques associated with techniques of domination and self.

The analysis satisfies governmentality components stated by Mehta and Darier 1998, 109) such as the centralization around institutions or private corporations. There can also be an intensification of the effects of power at both the individual and organizational levels due to the emergence of new forms of knowledge. The implications of the shift in discourses of knowledge, choice and power can affect both sides of the narratives. In turn, creating new interpretations of technologically enabled consumer empowerment.

Conclusion

I have attempted to show how the use of VRM systems can constitute techniques of technologies of domination and techniques of technologies of self. The techniques, present in the Foucauldian concept of governmentality show increasing parallels with the state of consumer empowerment. Both concepts exist between the states of eternal domination and self- government (Shankar, Cherrier and Canniford, 2006, 1017). The scope of research has been limited to marketing practices from which I derive narratives of consumer dissatisfaction: information inequities and disciplining. I then used these narratives as a basis for contextualizing discourses of knowledge, choice and power in modern marketing and consumption practices. I apply the framework to establish how the narratives could reveal themselves in the context of VRM tool use. I suggest that narratives of information inequities and disciplining can be created through VRM systems by increasing the risk of techno-plebiscitarianism (Gerbaudo 2012), and increased corporate power. Mehta and Darier (1998, 115) argue that in order to be efficient modern power must be subtle. Because of the Internet and the power that renders power less obvious the disciplining and normalizing effects are much greater. They suggest that the commercialization of the Internet might be merely the result of the trend toward the globalization of capitalism, while surveillance increases. The dominant languages and procedures present in technological advancements can become a barrier to many other consumers around the world. This could have profound effects on the way individual and collective subjectivities are formed in the future.

Marketers have made extensive use of disciplining capabilities throughout history (Kasabov 2004, 9), but consumers are starting to find ways around intrusive targeting methods. Adblocker and its subsequent rise have symbolized a new trend in consumer rebellion. VRM systems could either make it or break it. The possibilities the platform enables could be the foundation for establishing better, more profound, relationships with consumers. But, will this be enough to discipline

consumers into exchanging their data with brands? Research on consumer loyalty and trust online could be conducted, but until the functionalities of VRM systems are made clear, we can only make an educated prediction of the outcomes. The limitations policy makers impose on the usage of VRM systems will ultimately determine whether consumers can be fully empowered online. While my speculative predictions remain somewhat pessimistic, personalized control over data could encourage innovative business processes leading to states of mutual advantage. Virtually constructed realities and identities can be considered as signs of inclusion into an established market structure but also as emancipation from reality. VRM systems affect consumer identity when used for other purposes such as online gaming, dating or gambling. Research related to society's ability to self-govern online and offline could be conducted to understand this point in more depth. The right approach in this instant is not to deny the light side of Big Data, but rather to devise techniques that bring human judgment and technological prowess to bear in a meaningful balanced manner (Ekbia et al. 2014)

VRM systems certainly offer some emancipatory promises, but these too are inevitably structured within market relations and algorithmic designs. The fast developing pace of technological innovation means that discourses of knowledge, choice and power are continuously changing. Policymakers are becoming increasingly more challenged to draw the lines between ever-changing power structures online. Research should combine an array of disciplines to understand these challenges. In my analysis I have attempted to combine Foucauldian concepts of governmentality and marketing narratives of consumer empowerment to develop discourses of knowledge, power and choice. These discourses evolve through the use of VRM systems establishing narratives of information inequities and disciplining online.

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