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Kunz, W., Heinonen, K. and Lemmink, J. (2019), Future service technologies: is service research on track with business reality?, *Journal of Services Marketing*, Vol. 33 No. 4, pp. 479-487. DOI [10.1108/JSM-01-2019-0039](https://doi.org/10.1108/JSM-01-2019-0039)

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**Future Service Technologies –
Is Service Research on Track with Business Reality?**

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27-01-2019

Citation: Werner H. Kunz, Kristina Heinonen, Jos G.A.M. Lemmink (2019): “Future Service Technologies – Is Service Research on Track with Business Reality?,” *Journal of Services Marketing*, Vol. 33, forthcoming

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The authors would like to thank Ruud Wetzels (Department of Marketing and Supply Chain Management, Maastricht University School of Business and Economics) for his assistance in collecting data and performing text mining analytics. They also want to thank the numerous anonymous reviewers for their valuable contribution to the special issue. Kristina Heinonen would like to acknowledge the support of the Fulbright Association, Hanken Support Foundation and Foundation for Economic Education.

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Structured Abstract

Purpose – Service technologies are transforming the business landscape rapidly. This paper aims to explore the current scope of research in regard to emerging service technologies by comparing the content of articles in academic journals with practitioner-oriented publication outlets.

Methodology – A total of 5,118 technology-related articles from service journals, service conferences, business journals and business magazines are analyzed. Text-mining on abstracts is used for the thematic and semantic analysis. Common research themes and their relationships are depicted in a two-dimensional structured network. Further, the sample is analyzed regarding various technologies mentioned in the Gartner Hype Cycle.

Findings – The paper reveals differences in academic and business perspectives in regard to service technologies. In comparison to business journals, scientific service research is more focused on customer-related aspects of technology. Service research has a less concrete focus on technology than in business publications. Still, service conference articles show a broader scope of emerging service technologies than academic journal articles.

Research Implications – Scientific research should focus on more concrete service technologies. Business magazines serve as a good source for that and the paper identifies several promising new technology fields

Practical Implications – Although business magazines cover significantly more concrete service technologies, they miss the integrated perspective that academic articles usually offer. Academia can help business to better align concrete technologies with different internal and external perspectives.

Originality/Value – This paper serves as an introduction to the special issue Future Service Technologies. Additionally, a quantitative study of recent service technology research serves as a reality check for academic researchers on business reality and provides research and practical recommendations.

Introduction

In recent years, new service technologies have radically transformed how individuals, businesses and society function. This has consequences for both the demand and the supply sides of business (Caro and Sadr, 2019). Technologies like smartphones, biometrics, artificial intelligence, robotics, text mining, Internet of Things (IoT), digital media, virtual reality (VR) and augmented reality (AR) improve companies' capabilities and change the customer experience significantly (Belk, 2013; Čaić *et al.*, 2018; van Doorn *et al.*, 2017; Huang and Rust, 2018; Kunz *et al.*, 2017; Wirtz *et al.*, 2019). In addition, technologies disrupt the prerequisites of most industries and sectors (Subramanian *et al.*, 2019; Porter and Heppelman, 2014; van Alstynne *et al.*, 2016). Whether one looks at B2C or B2B settings, technology is taking center stage. The advancements in technology will influence the resilience and welfare of industries, markets and societies in unpredictable ways. Developments in technology primarily influence the service sector because they are transforming the way organizations interact with their markets (Caro and Sadr, 2019). Service technologies are used in all kinds of industries, including manufacturing, health care, education and transportation. By service technologies, we mean networked technology interfaces or devices that enable and augment customer–business interactions and relationships (c.f. Porter and Heppelman, 2014; Meuter *et al.*, 2000; Wunderlich *et al.*, 2015).

Service research has begun to address the implications of disruptive technology for business. The concept of service technologies is not new, and service research has been interested for decades in how technologies facilitate service processes (Meuter *et al.*, 2000; Bolton and Saxena-Iyer, 2009; Hoffman and Novak, 1996). New service technologies are emerging at a faster pace and

with increasingly more significant consequences for individuals, organizations and societies in general (Wirtz *et al.*, 2019; Subramanian *et al.*, 2019), which warrants a fresh perspective on technology's effects. New research is appearing that is focused explicitly on the changing conditions in markets and societies, and although the change is related to not only technology but also to environmental issues, global mobility, increasing collaboration between stakeholders and other global events, technology is undoubtedly a key factor triggering disruption. Recent research has explored these new service technologies, and most recent contributions are theoretical and focus on developing the conceptual foundations of service technologies. For example, Wirtz *et al.* (2019) explored the role of service robots in frontline service and described the interplay between human and non-human tasks in service processes. Lariviere *et al.* (2017) introduced the term "Service Encounter 2.0" to highlight changes that are fundamentally due to rapid evolutions in technology and the authors provide a synthesis of the changing interdependent roles of technology, employees and customers. Huang and Rust (2018) investigated how AI will transform the work of service employees by increasingly contributing to intuitive and empathetic tasks in addition to mechanical and analytical ones. Scholz and Smith (2019) explored the potential of AR to deepen customer engagement and described passive and active elements of AR applications. They argue that non-participant bystanders and background, although passive elements of AR, also influence engagement in addition to the active ingredients that include the participants and augmented content.

There have also been recent empirical studies of service technologies. The study by Čaić *et al.* (2018) qualitatively explores the role of socially assistive robots in the care of the elderly. It suggests six roles of socially assistive robots that show that robots provide safeguarding, social

contact and cognitive support for the elderly. Research is thus emerging, but to take full advantage of the potential opportunities of service technologies, a holistic understanding of the current understanding and scope is needed.

Essentially, the sheer speed of technological advancement is pushing academia and business equally to reimagine their current perspectives and frameworks. To systematically benefit from the advancements in technology, it is paramount to focus research activities on how service technologies are transforming the business landscape. Research is emerging, and in the last few years, there have been many calls for more research on service technologies (c.f. Huang and Rust, 2013; Kunz *et al.*, 2018; Kunz *et al.*, 2017; Kunz and Walsh, 2018; Heinonen *et al.*, 2018; Hollebeek *et al.*, 2018; Hollebeek and Belk, 2018; Mele and McDavid, 2018; Paluch and Wirtz, 2018; Corsaro *et al.*, 2018; Moreau *et al.*, 2019). These calls indicate the critical need for a better understanding of the broad array of different technologies and their impact on business practices. In principle, service technologies can provide organizations with specific opportunities for growth based on innovative business models, informed decision-making and transformed behavior (Porter and Heppelman, 2014; Wunderlich *et al.*, 2015). Also, the users benefit from enhanced experiences and better support in everyday life (Čaić *et al.*, 2018). However, because the technologies are still emerging, there is currently a need for further understanding of their growth potential and future trajectory.

This paper tackles the growing need for more information by focusing on the current understanding of service technologies. The aim is to explore the current state of research in service technologies by comparing scientific research with practitioner-oriented research and

evaluate how well the focus is aligned with emerging technologies. Further, it serves as an introduction to the special issue Future Service Technologies and provides an overview of the articles included in this issue. This issue of the *Journal of Services Marketing* helps advance knowledge about future service technologies, and it includes nine articles and two commentaries, each with its own focus on a specific area of future service technologies. This article is divided into two sections. First is an exploration and discussion of the perspectives on service technologies addressed in academic research and managerial business outlets. Second is a description of the articles constituting the basis of this special issue.

Academic and Business Focus on Service Technologies

Given how relevant technology is for academia and business, it is important to explore whether the interest in service technologies is aligned between academia and business or if researchers and managers are developing their fields in different directions. To that end, this paper explores the content of recent articles regarding service technology published in leading academic and business publications. The focus is explicitly on the last two years in order to develop a holistic understanding of the scope of current research. Differences in the focus on service technology can give insights about missing research opportunities or a lack of effective communication about academic research insights to the business world.

Methodology

Articles from academic and business publications over the last two years are explored. For the academic side, technology-related articles in 33 service- and non-service-specific journals are identified based on the *SERVSIG Service Literature Alert System* (Kunz, 2019). Because the academic publication process takes some time, conference proceedings from the *Frontiers* and *SERVSIG* conferences of the last two years are also considered for gaining insights into research work in progress and the future trajectory of research.

For the business side, the focus is on technology-related business journal articles from *Harvard Business Review*, *Sloan Management Review*, *California Management Review* and *Business Horizon* (see section on practitioner-oriented journals; Kunz, 2019), and similar to the academic side, there is also a focus on more future-oriented developments from articles in business magazines like *The Economist*, *Ted Talks* and *Fast Company* from the last two years. There was a total of 5,118 technology-related articles collected and analyzed (service journals: 104 articles; service conferences: 152 articles; business journals: 124 articles; business magazines: 4,739 articles).

Text mining was used to identify repeating themes and concepts, based on article abstracts, and the results were mapped in a two-dimensional structured network for all four publication types (see Figure 1). Text mining converts a textual corpus (e.g., a set of journal publications) into a structured overview of concepts (Wilden *et al.*, 2017). To this end, the program Leximancer, which relies on a Bayesian learning algorithm, was used to conduct both conceptual (thematic)

and relational (semantic) analyses of text extracts, allowing for the investigation of concepts (common text elements) and their relationships.

The relationships between the identified concepts are mapped out in a network diagram, where commonly related concepts (i.e., co-occurring in abstracts) are linked by the edges. It is important to note that the Leximancer-based approach does not require the input of a manually created dictionary because a domain-dependent dictionary is automatically developed from the respective data sets used as input (Smith and Humphreys, 2006). Using this methodology for all four publication outlet types, it was possible to gain a comprehensive overview of the current scope of academic and business articles regarding service technology, but also determined were potential future trends based on conference papers and business (technology) magazine articles, which are by nature more forward-looking.

Results

Due to the comprehensive nature of the text mining approach, the resulting network diagrams can be very complex. For this paper, the focus is on two aspects of the network diagrams:

- **The degree of concreteness** describes the separation between **technology as a concept** and **concrete technologies** in the network. When technology as a general concept is discussed in the context of concrete technologies or applications (e.g., AI, IoT, bots, etc.), it is considered to involve a high degree of concreteness.

- **The degree of internal (or external) integration** describes the relationship between **technology as a concept** and **internal management-oriented** (or **external customer-oriented**) concepts. If the technology is studied in an internal context, managerial challenges and consequences are the focus of the contribution. However, if the technology is studied from an external perspective, customer challenges, demands and experiences are primarily considered.

Figure 1 shows the differences between academic and business publications regarding extant research and future-oriented publications. The four quadrants present the differences in the use of technology as a concept, the focus on concrete technology and the focus on the internal (managerial) and external (customer-related) aspects of technology. Given the distinct publication and dissemination process of the different quadrants, we can make observations about different trajectories (not all technologies are presented in each quadrant because of the density of the resulting networks. However, the analyses are based on the full set of the text corpus.) Overall, service conference papers (Q2) are considered to be a future feed of service journal articles (Q1) and reveal future thematic focus areas. Moreover, due to the difference in publication pace, business magazines (Q4) are considered to be timelier than business journals (Q3).

[Figure 1 about here]

Q1 – Service journal articles: Service journal articles score relatively low on concreteness. Only a few concrete technologies are presented in the network diagram, and they are widely separated

from technology as a concept. It seems that technology is addressed rather as a general concept than with regard to concrete technologies. Thus, the role of technologies is acknowledged rather than studied in an applied setting or dealing with concrete implications of specific technologies. Regarding the integration of technology as a concept, it seems to be more integrated with internal processes than with external stakeholders (e.g., customers). In other words, there is much attention put on managerial consequences and not so much focus on the impact of technologies for customers.

Q2 – Service conference papers: Service conference papers score higher on concreteness in comparison to Q1. Numerous technologies, including AR, VR, robotics, artificial intelligence and blockchain are covered. Regarding integration, technology is connected to internal and external concepts, with a slightly closer focus on external perspectives. Thus, technology management is studied along with the consequences for customers.

Q3 – Business journal articles: Compared to Q1, business journal articles score slightly higher on concreteness. Integration seems to be addressed from both perspectives of internal and external concepts. There is a bit more focus on managerial perspectives than on customer perspectives.

Q4 – Business magazine articles: Business magazine articles score high on concreteness, but are low on integration of both perspectives (internal and external concepts). Many more concrete technologies are discussed here. However, the discussion is less about actual managerial and consumer issues and consequences.

Considering the differences between Q1 and Q2, a clear trend can be seen in academia to deal with concrete technologies from both internal and external perspectives. This is a welcomed trend and can be perceived as a move in the right direction for the service management discipline. However, in comparison with the business outlets, academia should focus even more on the integration of internal and external perspectives in the future. Business journals (Q3) seem to be ahead in this regard. Additionally, academia could learn from business magazines (Q4) in terms of how they provide more concrete insights than Q1 or Q2 regarding specific new technologies. This information could serve as valuable input for academic research agendas. On the other hand, academic research can supplement the insights from business outlets. While business magazines are dealing with more concrete technologies, they miss the level of internal and external integration found in academic journals (see especially Q2). Translating core technology innovations into managerial as well as customer experience consequences will add relevant knowledge to the service field.

Figure 1 compares the different focus areas of current and future research present in academic and business outlets. In an additional step, an attempt is made to better understand which technologies receive the primary attention of academia and businesses. For that purpose, the specific technologies described in the Gartner Hype Cycle of Technologies (Gartner, 2017) were used. The hype cycle developed annually by the IT consulting firm Gartner shows the trajectory and maturity of different emerging technologies or applications in a graphic manner. It describes specific technologies through a life cycle of different phases as well as predictions about when the specific technology will face mainstream adoption.

For the analysis, 37 different technologies were taken from the 2017 Gartner Hype Cycle, and their coverage in each quadrant was analyzed. The analysis built on Gartner's mainstream adoption predictions and distinguished between technologies that will face mainstream adoption within 5 years (<5 years, 14 technologies) and technologies that will face mainstream adoption only after 5 years (>5 years, 23 technologies).

Percentages were calculated for “<5 years” and “>5 years” technologies covered by articles in each quadrant (see Figure 2). The findings indicate that service journals only cover less than 10% of <5 years and >5 years technologies, while service conference papers cover 29% of the <5 years technologies and a full 44% of the >5 years technologies. Business journals scored, respectively, 29% and 17%. In other words, these findings correspond to the previous analysis in Figure 1 that business journals still score higher than service journals on all technologies. However, service conferences paid significantly more attention to >5 years technologies. Thus, new technologies (adoption >5 years) are underrepresented in business journals, and these journals play on the safe side. Service conferences deal with relatively new technologies that could feed business journals with the newest insights regarding more than the technologies themselves. They also integrate managerial consequences and customer impacts that could speed up knowledge transfer to the business community.

Finally, business magazine articles covered 50% of <5 years technologies and 70% of >5 years. This means that the focus is undoubtedly on future technologies in these outlets, and these articles could be a source of inspiration for service researchers. As the pace of innovation and introduction of new technologies increases, this source will gain importance.

[Figure 2 about here]

A conclusion can be made that academic research can provide business magazines the necessary integration of technological concepts with the broader context. Integrating these technologies in a broader internal managerial or external customer context is not the strength of business expert magazines. Therefore, this provides an opportunity for future academic service research.

Research shows clear differences between academia and business in perspectives on service technologies. Based on the assembled data, areas of research are identified that can help to align business and academia for mutual benefit. When comparing technologies addressed in service conference papers (Q2) with technologies covered in business magazines (Q4), it is clear that there is a gap, indicating that service research should consider more concrete technologies covering a broader spectrum, including technologies such as 4D printing, brain–computer interfaces, commercial UAV, drones, deep reinforcement learning, digital twins, edge computing, quantum computers and volumetric displays, which were not covered in our sample at all.

New Contributions to Future Service Technologies

Following a call for research on future service technologies, this special issue presents nine articles that cover different technologies and approaches to companies and customers. Six articles deal with what can be described as the Internet of Things (Mani and Chouk, 2019; Harwood and Garry, 2019; Paluch and Tuzovic, 2019; Ling, 2019; Nyström and Mickelsson,

2019; Brügger *et al.*, 2019) and three deal with (ro)bots (van Pinxteren *et al.*, 2019; Čaić *et al.*, 2019; Liu, 2019). These articles nicely represent the primary focus of current service research, with emphasis on, for example, trust in and resistance to technologies, interactivity, social presence and seamless experiences. Also included are two invited commentaries on the topic, complementing the comparison of service perspectives as addressed in existing research and the articles in this special issue. The commentaries elicit new ideas about how to manage and analyze these future technologies. Kristensson (2019) discusses how future technologies enable value co-creation for customers as well as companies, and Zaki (2019) presents digital technologies for the next generation of services. These technologies are enabling the creation of value, and a company's readiness for change is an essential facilitator of the enabling process. The commentaries provide us with two perspectives on the same challenge to understand the trajectory of service technologies. One commentary takes a co-creation perspective; the other is from the perspective of new digital technologies. Both address the opportunities and challenges for customers as well as companies. Next, the content of the nine articles in this special issue are briefly summarized.

The acceptance of new technology is one of the most essential steps for future success. This is especially true for IoT applications and smart services. Mani and Chouk (2018) look into barriers to this acceptance and the factors that reduce and raise these barriers. Based on online survey data, they found that personal consumer-lifestyle factors reduce consumer resistance to smart services, while innovation-related and ecosystem-related risk factors increase consumer resistance to smart services. The study has implications for the acceptance of one of the biggest

technology trends in recent years. Taking consumer risk perception and lifestyle preferences into serious consideration is critical for the success of these new services.

IoT is enabling products, machines and providers to connect seamlessly with users. Harwood and Garry (2019) study cyber-physical systems of household products with the purpose of revealing predictors of consumers' trust in such technologies. The empirical study contributes to the emerging research on complex technology systems that connect several service providers and users across a broad constellation of usage areas, such as household management and security. The article has implications for service research in broadening the understanding of service systems and network actors. This understanding is also relevant for all types of organizations in their attempts to connect to their customers more comprehensively.

The third article also covers customers' perceptions of technology. Service technologies allow users to track their daily activities and performance carefully. Consumer interest in self-tracking through mobile devices and wearables has increased, and it can also create opportunities for service providers if consumers are willing to share personal information such as biometric data. Paluch and Tuzovic (2019) address the challenge of how to persuade consumers to provide such personal data about their daily lives for the service provider's use. They explore consumers' adoption and perceptions of persuaded self-tracking, that is, service offerings that require the sharing of personal data in exchange for specific rewards. The study contributes to the understanding of how wearable technology can be used in the commercial domain as a tool to support customer-provider relationships.

Advertising is another context where new service technologies have been applied. In a study on location-based services, Ling (2019) explores how a mobile coupon subscription service can encourage in-store purchase intentions. Location-based advertising involves targeted advertising delivered to a mobile device based on the location of the consumer. The study is relevant for marketers given that the extensive use of mobile phones enables real-time interaction with consumers in stores, but the challenge is to avoid being intrusive. Two experimental studies were conducted in a shopping mall, and they reveal how time-consciousness and decoy promotional messages influence purchase behavior. The findings have implications for how to develop timely and relevant offerings for customers—an issue of great relevance to all retailers.

The fifth article also addresses how the role of advertising has changed with the increasing use of different technologies. Nyström and Mickelsson (2019) explore how technological advancements are changing traditional advertising and sales functions in organizations. In their conceptual study, they propose an approach to digital advertising as a service, which means that it is seen as a resource in customers' value creation. The focus is on contextually embedded selling that denotes the process where digital advertising content is thematically congruent with the surrounding editorial content so that both contribute to the same customer. This means in practice that customers interact with a network of interlinked digital media content (such as YouTube, blogs, or news services) and shift from one media item to another. Contextually embedded selling stresses the notion of a seamless digital media experience and avoids contextual jumps, including thematic, temporal or spatial incongruences. The implications of reframing digital advertising as a service relate to the importance of creating value-in-use rather

than persuasion and attention. Managerial attention needs to be on the fit between media content and customers' underlying value creation processes.

The sixth article in this issue emphasizes that interactivity with service technologies plays an essential role in customer perceptions. In their study about retirement planning, Brügger, Post, and Schmitz (2019) investigate how an online pension planner can increase consumers' interest in and attention to their pensions. The study deepens the understanding of how interactivity can encourage interest in a low-engagement service such as retirement planning by increasing user enjoyment and self-efficacy. This is relevant because pension planning is typically not a service offering that gathers much interest among consumers until retirement age is approaching, but it is beneficial to start retirement planning while still at an active work age.

Service robots are one of the strongest growing research topics in recent years. The introduction of service robots on the frontline represents a dramatic shift in the concept of service delivery (Wirtz *et al.*, 2018; van Doorn *et al.*, 2017). But many aspects are still unknown. For instance, what kind of value do service robots represent for the customer? How do people develop relationships with robots, and do they trust them?

Van Pinxteren *et al.* (2018) conducted an experimental study that compared human-like appearance versus social functioning features of robots and how these features influenced trust. They used gaze cues in the form of color changing eyes and tested their influence on the perception of anthropomorphism, trust and enjoyment and found that interaction comfort is an important moderator for the gaze cue anthropomorphic relationship. The study shows nicely how

vital even small design features of a humanoid robot are and how they influence overall trust and enjoyment of the device.

The eighth article acknowledges complexity in the value of social robots. Čaić *et al.* (2019) develop a conceptual model of the value co-creation/destruction potential of social robots in services. They focus mainly on social robots in elder care services and show ways in which their human-like affect and cognition influence users' social perceptions and anticipation of robots' value co-creation or co-destruction potential. The article gives helpful insights for managers to design service robots and how to integrate them in a bigger service system.

The amount of data being generated in different channels has increased tremendously over the last decade, and researchers have been trying to decipher the resulting big data. In a Twitter-based study, Liu (2019) explored how social bots can distort the information generated about different brands. The paper addresses the mechanisms of how word-of-mouth communication can go viral on Twitter with the help of social bots. Social bots are technology-based automated communication mimicking human beings on social media. The findings indicate that volume and emotions are the most critical factors related to a message going viral on Twitter. This article is important because it links to the much-debated issues of fake information that is distorting opinions on social media.

Conclusion

In conclusion, a number of insights can be gained in this issue into the reality check around service research of new technologies. One comes from the selection of papers for the special issue itself. In 2017, a call for service research on future service technologies was announced. The service research community responded with numerous papers addressing this issue. After multiple review rounds, nine papers were selected for this special issue. From the perspective of the 37 new technologies identified by the Gartner Hype Cycle, it is surprising that the contributions only deal with two broad technology categories, which are IoT and (ro)bots. Although this is a good start for service research, it also means that there is room for future research to put other technologies in the spotlight and to address the impact on consumers and companies. Most articles also take an external approach to service technologies by exploring customer perceptions and experiences of such technology.

Based on this special issue's six articles, two commentaries, and the text mining study discussed earlier, some lessons can be learned and conclusions and implications drawn for research and practice. First, it can be seen that the incorporation of concrete new technologies is mostly missing in the academic literature and, in general, integration with managerial consequences and consequences for customers is limited. Moreover, scientific service research is more focused on customer-related aspects of technology than are business journals.

Second, service conferences—as an indicator of the future trajectory of service research contributions—contain more and newer technology studies. This means that the service domain

is already heading in the right direction, leading to a call for studying a broader scope of new technologies and encouraging more integration with management and marketing insights.

Service conferences deal with relatively new technologies that could feed business journals with the newest insights regarding more than just the technology itself. Service conference contributions tend to integrate managerial and marketing insights that have the potential to speed up knowledge transfer to the business community and that contribute to the effectiveness of technological innovations.

Third, business magazines are a great source of research ideas and opportunities with regard to future technologies. Given the gap revealed by a comparison of technologies addressed in service conference papers and those covered in business magazines, it is clear that service research must consider more concrete technologies over a broader spectrum, and articles from business magazines that focus on future technologies can be a source of inspiration for service researchers (e.g. drones, quantum computers, 4D printing, brain-computer interfaces, edge and quantum computers).

Fourth, academia can help businesses better align internal and external perspectives. Academic research can provide business magazines the much-needed integration of technological concepts into a broader context. This provides an opportunity for future academic service research focusing on the relationship between the management of technology from a company's point of view and the integration of customer roles and needs.

The findings of literature-based textmining approach and the issues addressed by the articles featured in this special issue of the *Journal of Services Marketing* indicate the expanding relevance and influence of service technologies for a broad spectrum of organizations and industries. Although the articles address issues in the commercial context of consumption, the impact on society at large is also very much present. For example, robots are expected to transform not only consumer experiences and frontline employee behavior but also the ability of public and private organizations to contribute to societal well-being through better service outreach.

In conclusion, this analysis of current and fresh contributions to research indicates that the discipline is well underway given the progress that has been made in conferences. Many new technologies have already been addressed. Given the urgency of the new technologies and the changes in technologies moving at a rapid pace, the service field must always be aware of new opportunities to change customer experiences and present value-added services in the blink of an eye, and researchers should be prepared for this imminent future.

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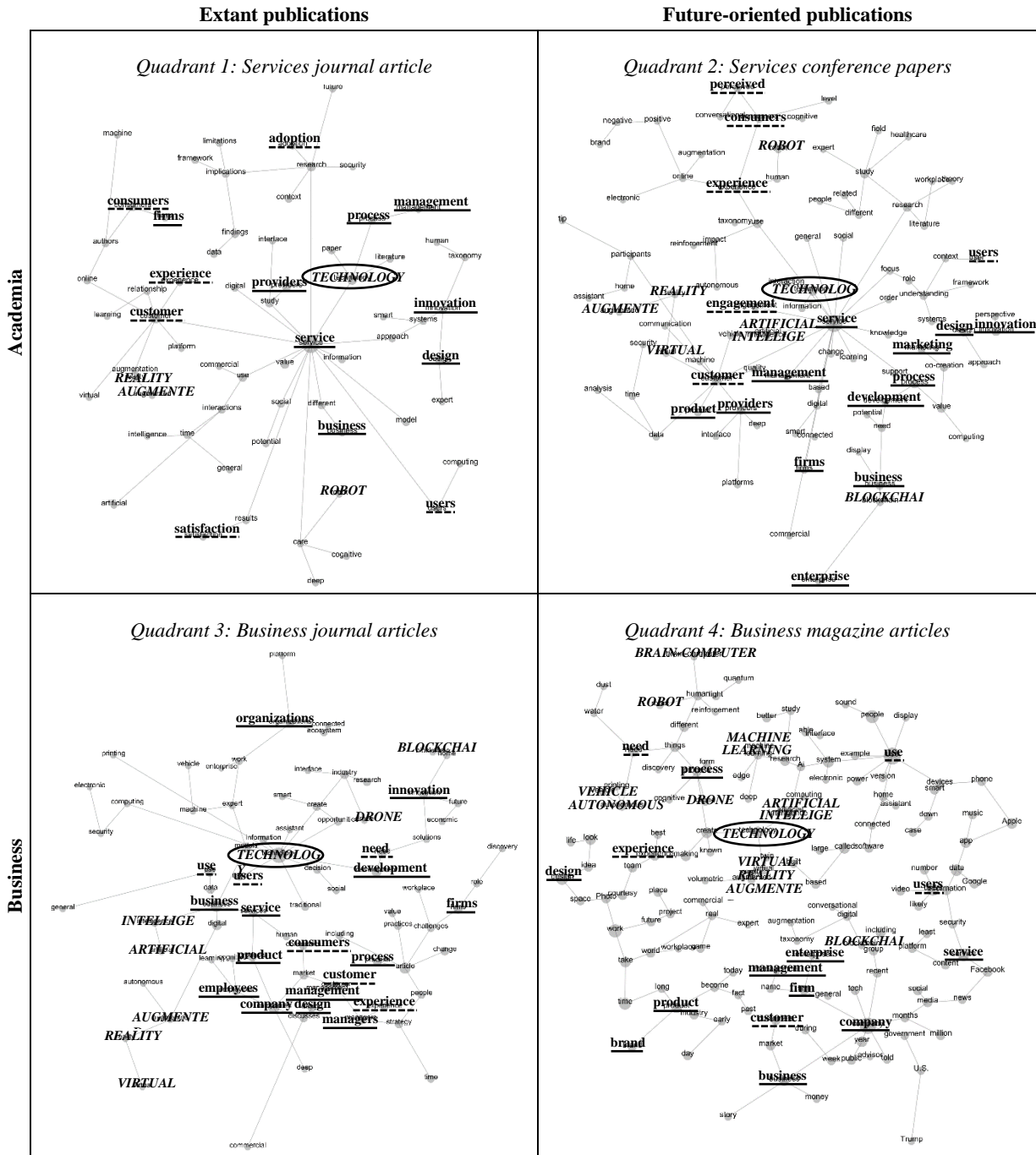
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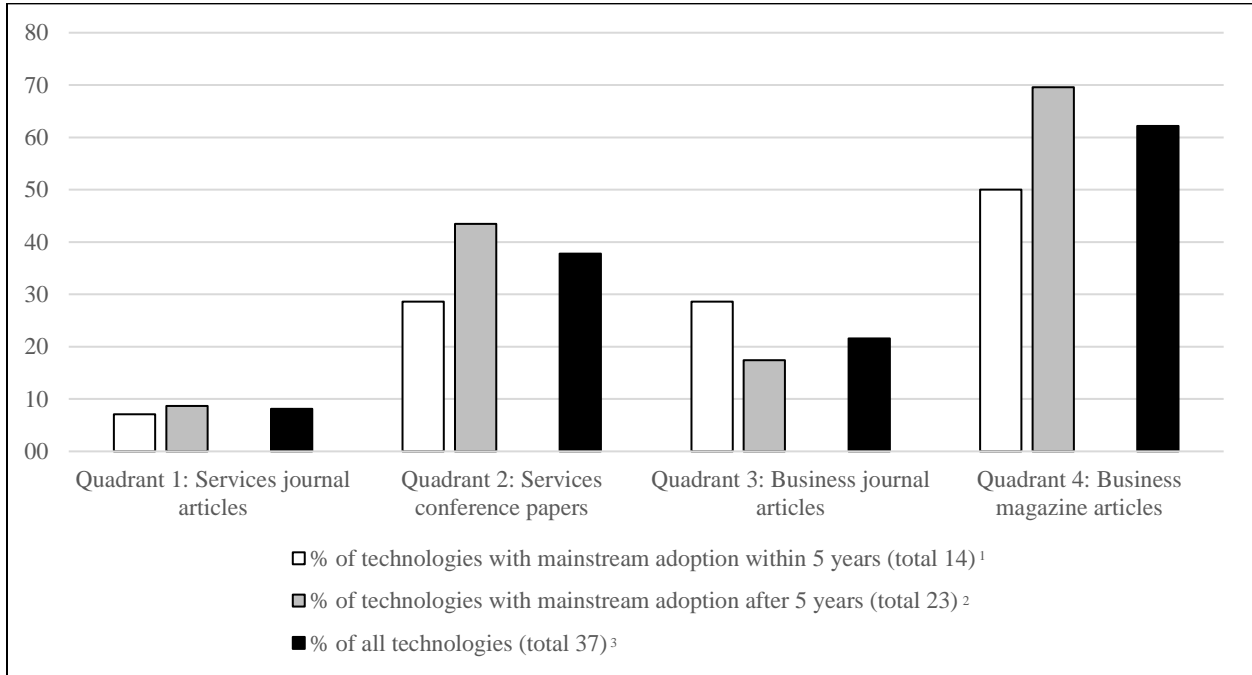
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Figure 1 Concept networks for extant publications and future-oriented publications in academic and business articles.



ABC = technology as a concept; **ABC** = concrete technology; **abc** = internal concept; **abc** = external concept

Figure 2 Penetration of Number of Emerging Technologies according to Gartner Hype Cycle 2017, per quadrant.



¹ Augmented Data Discovery, Cognitive Expert Advisor, Commercial UAV, Deep Learning, Drone, Edge Computing, IoT Platform, Machine Learning, PaaS, SaaS, Serverless PaaS, Serverless SaaS, Software-Defined Security, Virtual Reality; ² 4D Printing, 5G, Artificial General Intelligence, Augmented Reality, Autonomous Vehicle, Blockchain, Brain-Computer Interface, Cognitive Computing, Connected Home, Conversational User Interface, Deep Reinforcement Learning, Digital Twin, Enterprise Ontology Management, Enterprise Taxonomy Management, Human Augmentation, Nanotube Electronics, Neuromorphic Learning, Quantum Computing, Smart Dust, Smart Robot, Smart Workplace, Virtual Assistant, Volumetric Display; ³ 4D Printing, 5G, Artificial General Intelligence, Augmented Data Discovery, Augmented Reality, Autonomous Vehicle, Blockchain, Brain-Computer Interface, Cognitive Computing, Cognitive Expert Advisor, Commercial UAV, Connected Home, Conversational User Interface, Deep Learning, Deep Reinforcement Learning, Digital Twin, Drone, Edge Computing, Enterprise Ontology Management, Enterprise Taxonomy Management, Human Augmentation, IoT Platform, Machine Learning, Nanotube Electronics, Neuromorphic Learning, PaaS, Quantum Computing, SaaS, Serverless PaaS, Serverless SaaS, Smart Dust, Smart Robot, Smart Workplace, Software-Defined Security, Virtual Assistant, Virtual Reality, Volumetric Display.