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Waiting for a sales renaissance in the fourth industrial revolution: Machine learning and artificial intelligence in sales research and practice

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ABSTRACT

Experts have suggested that the next few decades will herald the fourth industrial revolution. The fourth industrial revolution will be powered by digitization, information and communications technology, machine learning, robotics and artificial intelligence; and will shift more decision-making from humans to machines. The ensuing societal changes will have a profound impact on both personal selling and sales management research and practices. In this article, we focus on machine learning and artificial intelligence (AI) and their impact on personal selling and sales management. We examine that impact on a small area of sales practice and research based on the seven steps of the selling process. Implications for theory and practice are derived.

1. Introduction

We are undergoing a time of profound transformations powered by digitization, information and communications technology, machine learning, robotics and artificial intelligence (Gupta, Keen, Shah, & Verdier, 2017). Many commentators in the business and economic sphere suggest that this will usher in a new epoch—the Fourth Industrial Revolution (Marr, 2016). The fundamental shift in the fourth industrial revolution will be in the area of decision-making. Whereas traditional informational technology helped with processing of communications and data, the decision-making was human. The new shift will be evident in emerging technologies allowing computers to also make reliably appropriate decisions. This digitization shift has begun and will have profound implications for personal selling and sales management functions. The sales profession has always changed in response to changes in the larger macro-environment (e.g., technological, macro-economic, demographic, cultural) within which it operates. As an example, with the advent of advanced telephones and rapid transportation, the sales profession moved away from the stereotypical Willy Loman (from *The Death of a Salesman*) type of traveling salesman with defined routes to visits based on demand. Similarly, with the advent of the Internet and databases, information became more widely available and some of the ordering moved away from written orders to ordering on the internet.

We hypothesize that selling in future decades will be disruptive and discontinuous, owing primarily to shifts in technology. In other words, digitalization of sales functions with the addition of artificial intelligence and machine learning represent a discontinuous change compared to the non-digital era. For example, an emerging firm, Node, uses machine learning and artificial intelligence to harness large databases and match them with data available on the web to create prospect lists (Node, 2017). Their website promises to provide “strategic insight, tactical guidance and cutting edge technology to help anyone find the right person at the right business at the right time with the right message...” (Node, 2017). Analogous to changes as Europe transitioned from the Middle Ages to the Renaissance, we label this shift as the “Sales Renaissance” where the focus of sales management will transition from traditional sales functions to new functions that may involve bridging inter-organizational and intra-organizational boundaries.

In this paper, we explicate the anticipated technology and environmental changes, and discuss existing machine learning and artificial intelligence technologies and processes. We then discuss the implications of technologies on selling functions. Our focus is on the sales process as a critical element of research and practice, and we use the seven steps of selling to describe the basic selling process (Dubinsky, 1981). In order to provide a deeper focus, the paper does not address big data in-depth for two reasons. First, discussion of big data in sales would be a paper by itself. Second, the definition of big data will change with advances in computing such that data sets that are ‘big’ today will become normal in the future. We have therefore focused on the more fundamental shifts, which are digitalization driven by machine learning and AI, rather than the size and ‘quality’ of available data.

The next section presents emerging trends in technology and

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environment. In the section after that we will describe machine learning and artificial intelligence and emphasize certain tools. In subsequent sections, we will discuss the impact of these technologies and methodologies on the selling process and highlight areas where further attention is needed. The final section will summarize and discuss areas for further research.

2. The fourth industrial revolution

In this section, we discuss the emergence of the fourth industrial revolution with a historical perspective on the previous industrial revolutions. The first Industrial Revolution occurred when mechanization, water power and steam power multiplied the efficiency of productive technologies that had previously depended on human and animal labor. The second Industrial Revolution was ushered in by mass production and the assembly line style of production. This stage was facilitated by widespread availability of electricity that made factory production even more efficient. The third Industrial Revolution saw the advent of computers and automation. Automation that has increased with each industrial revolution, is seen as having both dramatic advantages and disadvantages. In the context of the third revolution, the processing power of computers and increased access to memory, which continues to increase, is ideally suited to automate repetitive and non-value added tasks (e.g., delivery information).

The fourth Industrial Revolution involves, among other things, cyber-physical systems of how humans interact with machines and also the Internet of Things (IoT) where machines interact with machines (Marr, 2016). In an article featured in April via Forbes online Tech/Big Data column Marr, an established expert on IoT, mentions that,

> "While some would argue IoT got off to a rocky start with a lower adoption rate than was predicted, most would agree the IoT is growing and will continue to grow in 2017 and beyond. Whether it reaches the lofty predictions of 50 billion connected devices by 2020 remains to be seen, but I strongly believe that businesses who learn to harness the data created by the Internet of Things are the ones who will survive and thrive in the future."
>
> (Marr, 2017)

The major difference from mere technological advances is the very close interaction between physical, digital and biological worlds. In this paper we concentrate on two aspects of the fourth industrial revolution—artificial intelligence and machine learning and provide a critical examination of how these will affect the selling function across all levels of firm sales and go-to-market strategy. By one estimate, as many as 47% of U.S. jobs are at risk from machine learning and AI fueled automation, and this will happen across a wide spectrum of industries, from salespeople, accountants, real estate agents, and insurance agents to drivers (Marr, 2016). Importantly, the jobs that will be eliminated are ones which currently minimally incorporate machine learning and AI. On the other hand, machine learning and AI also have the potential to vastly increase new jobs which will be driven by these emerging technologies. A recent report by the most prominent IT industry research firm Gartner estimates that enterprise technology powered by AI will create more jobs than it eliminates, and may well account for two million net new jobs by 2025. The new jobs will be both at "new positions of highly skilled, management and even the entry-level and low-skilled variety" (Loten, 2017). Moreover, for the sales function, there are clear limits to how much AI can eliminate sales jobs because of the critical role played by inter-personal buyer-seller interfaces in sales (Knight, 2017). Many, if not most, of the claims of job loss because of AI are due to exaggerated and wild extrapolations and generalizations of AI's capabilities (Brooks, 2017a). Brooks (2017b) mentions the 'performance versus competence' dichotomy that often lies at the heart of such exaggerations. We use cues about how a person performs some particular task to estimate how competent s/he may be at some different but related task. Say, that an experienced salesperson has reported to her manager that a major account that she has been working on has a 60% chance of closing. We naturally assume that she can reasonably answer questions like: *Where is the buyer in the buying process? How many decision makers are involved in the buying center? What are their personalities? What is the time frame for the buyer's decision?* The big mistake would be to assume that some AI powered software that has provided a 60% probability of close would also be able to answer these related, but very different, questions as competently as the experienced salesperson. In sum, the most reasonable expectation vis-à-vis the impact of machine learning and AI in the sales context is that salespeople will have to co-exist with AI and other technologies.

2.1. Machine learning and AI techniques used in sales

The term, machine learning, was coined by a pioneer in computer gaming and artificial intelligence, Arthur Lee Samuel (Lee, 1995), who used the term for the science of getting computers to act without being explicitly programmed. AI researchers use it as the best and most promising approach to the development of human-level AI. Merriam Webster.com (2017) defines artificial intelligence as, "a branch of computer science dealing with the simulation of intelligent behavior in computers." AI refers to the ability of machines to mimic intelligent human behavior, and specifically refers to "cognitive" functions that we associate with the human mind, including problem solving and learning. In the context of this study, machine learning is a prerequisite to the development artificial intelligence (Carbonell, Michalski, & Mitchell, 1983). In addition, machine learning requires substantial amounts of data (big data) and high processing power that is easily accessible. Therefore, our focus is on self-learning models and machine learning. A major advantage in using machine learning models for sales research is that the firm usually has customer exposure and purchase data. In contrast, in the advertising world, the cable TV providers and streaming services own the exposure data whereas the retailers own the purchase data. Thus, deploying these new approaches in the advertising context requires the researchers to first assemble data sets from various sources akin to assembling a 'jigsaw puzzle' (Malthouse & Li, 2017).

Traditionally, a model 'learns' from data when the parameters of a model are estimated based on data. Consider the simplest example of a linear regression problem that has only one explanatory (independent) variable. Given some data on the dependent (Y) variable and the single independent (X) variable, the Ordinary Least Squares estimates for the intercept and slope can be computed manually because there exists closed-form expressions for them. Thus, the linear regression model can learn from the data without the help of machines. However, in most realistic situations, parameters associated with multiple explanatory variables need to be related to their dependent variables in a highly nonlinear manner. Machine learning can be harnessed in these situations. The estimation of the parameters of such complex models require enormous computing power that only modern computers can provide. The complexity of estimating parameters is exacerbated when the data set is large and unstructured. Intuitively, large computers that continuously estimate parameters based on ever-increasing data that becomes available in real-time are utilizing machine learning. Machine learning and AI have clear advantages over traditional statistical methods when: (a) there are a multitude of variables available for analysis, (b) the associations between the variables is uncertain (and likely to be highly complex), (c) the values of each variable are evolving constantly (such as in the case of a GPS), and (d) when understanding correlations between variables is more important that causation. The great strength of machine learning models is in making predictions, especially where an atheoretical prediction will work well. This is the reason that machine learning models are evaluated on criteria such as scalability, real-time implementability, and cross-validated predictive accuracy rather than on internal and external validity and theoretical foundations which are more suited to the traditional models.

Machine learning methods can be broadly categorized into