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# Allocating resources in pricing – which capabilities are worth fostering in the face of AI?



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**Summary:** The field of pricing holds high potential for professionalization since it comprises a multitude of decisions based on sparse information sets, data-driven tasks and an ever more dynamic and fast-moving market environment. Therefore, advances in artificial intelligence (AI) will influence and maybe even disrupt pricing managers' roles within the pricing process. Using a Delphi study design, we aimed to take a look at future tasks and profiles of pricing managers. The results allowed us to extend existing models of pricing capabilities and classify which skills and know-how pricing managers should nurture and which ones may be left to artificial intelligence. Furthermore, we were able to derive implications for curricula as well as talent selection.



**Key words:** Pricing, Price Setting, Management Decision-Making, Artificial Intelligence, AI

**Ressourcenallokation bei der Preisgestaltung – welche Fähigkeiten sind es wert, angesichts Künstlicher Intelligenz gefördert zu werden?**



**Zusammenfassung:** Der Bereich der Preisgestaltung birgt ein hohes Professionalisierungspotential. Vor allem in der Entscheidungsfindung bewegen sich Pricing-Manager häufig in einem Umfeld spärlicher Informationsbestände, datengetriebener Aufgaben und einem immer dynamischeren und schnelllebigeren Marktumfeld. Daher werden Fortschritte in künstlicher Intelligenz (KI) gravierende Veränderungen im Pricing bewirken. Sowohl die Rollen der Pricing-Manager als auch der gesamte Pricing-Prozess werden sich unter dem Einsatz von KI und Automatisierung nachhaltig verändern. Die AutorInnen dieses Beitrages analysieren anhand einer Delphi-Studie zukünftige Aufgaben und Profile von Pricing-Managern. Die Ergebnisse umfassen eine Erweiterung bestehender Modelle der Preisgestaltungsfähigkeiten, sowie eine Klassifizierung von Skills und Know-How. Hieraus ergeben sich Implikationen für die (Aus-)Bildung von Pricing-Personal sowie die strukturelle Aufstellung von Pricing-Aufgaben innerhalb von Unternehmen.

**Stichworte:** Pricing, Preissetzung, Preisprozess, Entscheidungsverhalten, Künstliche Intelligenz, KI

## 1. Introduction & rationale

Pricing is a field where a multitude of decisions have to be made on the basis of sparse information. This leads to management failures and unused pricing potential, to ineffective decision-making and insecurity in the face of time pressure. Optimized processes, seamless support by information management tools as well as specified competences are the core of professionalization within companies. Especially in the age of big data and powerful information processing techniques pricing – as a data-driven task – is a promising field for the implementation of such professionalization measures. Established literature has long suggested to optimize pricing processes via information procurement (*Lancioni, 2005; Kossmann, 2008; Totzek/Alavi, 2010; Belz et al. 2011; Narver/Slater, 2012*). . However, there are even more challenges that have to be addressed when a fundamental change is about to occur: Firstly, the company that develops the most effective decision rules (be they mechanical or human-derived) will hold the competitive advantage only as long as these are inaccessible to competitors (*Barney, 1991*). Secondly, change processes require a change of culture and mindset among employees (*Homburg/Pflessner, 2000*). And thirdly, employees have to have the fitting skill set to cope with the decisions they keep making in the face of data processing technologies as well as the insecurity that remains and the technological applications that will be part of their everyday work reality.

In order to prepare for these challenges, we set up a Delphi study (e.g. *Delbecq/Ven, 1971; Linstone/Turoff, 1975; van Dijk, 1990; Ven/Delbecq, 2017*) to find out more on the developments within the field of pricing in the face of AI. Using the results of the study we identified skills, routines and coordination mechanisms which will most likely be disrupted by AI technologies, others which will be supported by AI and some which will even in future be dominated by human managers. Knowledge about these specific changes within the field of pricing will help companies to hire or select their pricing employees not only wisely but with the competitive advantage on their agenda. Furthermore, it will provide managers with an idea of the potential for professionalization. And lastly, it will help to develop and adapt the training of future marketing and pricing managers in the face of AI-driven pricing.

## 2. Theoretical context

Within the field of pricing it has often been stated that any professionalization would need to be based on an improved information procurement and related information coordination processes. *Kossmann (2008)* mentions the reduction of the amount of missing information as well as tailored internal coordination measures as major aspects required for an optimization in pricing. *Florissen (2008)* criticizes the status quo of information systems within companies as it is – together with a lack of pricing competences – the reason for rationality deficits in price management. *Totzek and Alavi (2010)* categorize the pricing-related information seeking into (1) the management of information processing, (2) the management of information seeking and (3) the exchange among roles and functions. All three aspects are mentioned as highly relevant management tasks for pricing professionalization. The challenges regarding these professionalization measures are threefold. Firstly, with the current state of pricing processes the company culture is a highly relevant factor in information procurement (*Homburg/Pflessner, 2000*). As it is a substantial task to systemize and document information, only the right incentives and company culture can

pave the way to effective coordination. Secondly, information procurement and decision support are an inter-functional and company-wide task (Wiltinger, 1998; Belz *et al.* 2011). Thirdly, decisions within pricing are generally considered black boxes (Sheth/Sharma, 2006). Not only competitors and customers seem to have difficulties understanding price decisions, but even within a company price-relevant information sets vary over products and decision taking entities and are highly situational.

Nevertheless, the market environment is growing ever more dynamic and competitive, reaction times have to be minimized and real-time information procurement becomes the center of attention (Florissen, 2008).

Research has shown that fast-evolving AI solutions are constantly becoming more relevant for fields of decision-making and decision-supporting (Strohmeier/Piazza, 2015; Catlin, 2017; Wirth, 2018; Bolander, 2019; Davenport *et al.* 2019; Reinecke, 2020). However, there is little research on how AI will disrupt the field of pricing – and especially price setting. To the best of our knowledge, the task of pricing has so far not been studied with respect to pricing as a capability in the face of a potential disruption through AI technologies. In marketing practice, however, the topic of AI is frequently being discussed and pricing applications have started to gain in importance.

All in all, current AI technologies are a combination of automation mechanisms rather than real intelligence. Therefore, one has to distinguish three basic evolutionary stages when using the term AI: weak, strong and hybrid AI (Greenwald, 2011; Martínez de Pisón *et al.* 2017; Wirth, 2018). The two extremes of an replication of broad human intelligence (strong AI) on the one hand and highly specified algorithms, which, however, are by far not as flexible as human intelligence (weak AI), on the other hand are complemented by hybrid AI, which describes more evolved AI solutions that comprise machine learning although they do not yet come close to human intelligence.

### 3. Problem statement & research questions

Pricing is a very data-intensive field. At the center of pricing managers' tasks usually stand information handling, the preparation of price-relevant information sets and the deduction of price points. Thus pricing managers might profit considerably from AI applications. But although pricing can produce significant effects in terms of revenue, AI is only starting to be used in practical pricing applications. And (academic) research on AI in pricing has just started, although knowledge about potential changes is vital for preventing disruptive processes and organizing structured transitions. However, the extent to which AI will be able to influence pricing and pricing managers' roles is highly disputed within research and among practitioners: AI could be able to take over pricing managers' competences, it could be used to support them during information processing and decision taking or AI could be an information tool used to monitor certain variables. Therefore, Rust (2019) suggests AI-induced job displacements within marketing as a crucial research area. We follow this lead by asking the following pressing questions: what do developments in AI mean for pricing managers, notably in the context of their future work, and how should they prepare for future competition in the field? Which skills should therefore be fostered in management education (curricula, trainee programs, internships) to prepare students and recent graduates for future requirements?

Many issues in pricing can be planned for and changed on short notice. But some decisions need more time for preparation, such as education. AI is a fast moving techno-

logy which may evolve within the blink of an eye. A change in management education, however, is a long-term process which requires new curricula, adapted internships and innovative on-the-job training programs. Due to this divergence a forecast on developments in the field of AI in pricing is ever more important. Our research project design addresses this specific need (see Chapter 4). Furthermore it is crucial to build awareness among companies and educational institutions in the market – awareness of the importance of pricing in companies and of an adequate education.

### 4. The Delphi study approach

We used a Delphi design to study the question how the field of pricing will change with the implementation of AI technologies. The Delphi method is a structured communication technique originally developed as a systematic, interactive forecasting method which relies on a panel of experts (Linstone/Turoff, 1975). This method is especially useful – compared to e.g. interactive focus groups – for generating information bases and fact finding related to a predefined question (Delbecq/Ven, 1971; Ven/Delbecq, 2017, p. 209). The Delphi design aims to achieve systematic knowledge through two consecutive rounds of questions with a summary in between, allowing (but not forcing) the experts to ultimately reach a consensus. The three-step Delphi study design provides experts with the possibility to receive and evaluate a cross section of assessments on a specific question. It has shown that the thereby achieved synthesis of experts' evaluations leads to a reliable prediction of future developments (therefore the name was chosen as a tribute to the Delphic oracle). As the goal of the study is to attain largely unbiased answers regarding AI's role in pricing in the future, this kind of exploratory research seems to be currently more appropriate than other qualitative research designs or (confirmatory) quantitative research.

The Delphi design was specifically used because (1) the authors aim to predict the implications of a frequently discussed trend; (2) reliable information on, and the adequate assessment of, new technologies in a certain field require a certain degree of expertise. Therefore, the sample comprised eight experts in the overlap of AI and pricing: the practitioners interviewed for this study are working either as consultants specialized in pricing or as managers in companies offering AI solutions for pricing or in industries in which pricing decisions are crucial and abundant (tourism, transportation and consumer packaging goods). The interviews were conducted within a three-month period of time in 2019.

As it is crucial to minimize drop-outs among the participants, the individual interviews were all conducted personally (via phone or video call) and comprised mainly open questions, as proposed by *van Dijk* (1990). Example questions are "What is your personal feeling towards an AI for pricing? How do you feel they could affect a pricing manager's decision-making?", "Do you feel like pricing could benefit from the development of AI? Please explain why and to which extent." and "Taking into account your previous answers, do you believe that AI might redefine and disrupt the roles of marketing and pricing managers?". After the first round each participant received an anonymous and consolidated executive summary, which was arranged by the authors as a result of the data collected throughout the interviews. This means that all content was presented equally and without reference to the specific experts who named it. After having worked through the summary thoroughly, each participant was interviewed again with another set of in-depth questions. The second round focused on critical topics and points of disagreement among

participants. Participants were asked the following questions among others: “After reading the report, do you have any remarks on its content? Where do you agree/disagree?”, “What are your insights on the future role of pricing and marketing managers? How do you believe these roles will change?” and “What would you say are the most important skills to be developed by humans in order to cooperate with machines? Do you agree on the importance of the skills mentioned in the report?”.

## 5. Results – first round

The first round of this Delphi study comprised questions regarding the future use of AI technologies in the field of pricing that ranged from obstacles, potentials, implementation to decision-making and the roles of humans and machines. From the conducted interviews we derived the experts’ main ideas on the future of pricing in the face of AI technologies. These can be summarized in five key theses which are presented in detail below. There was strong consent regarding four of them, one subject, however, engendered rather diverging opinions. These were debated in the second round and will be discussed in Chapter 6.

### 5.1 AI will represent a competitive advantage for pioneering companies (fast and early engagement in the change)

“I believe there will be a stronger impact in some sectors, where it [AI] will be a source of competitive advantage.” (Respondent A)

Artificial intelligence is able to perform a wide range of tasks faster than managers, does not need to rest and has no limit with regard to working hours. As the pricing experts confirmed, the field of pricing includes a wide range of administrative and repetitive tasks (such as data collection, data cleaning etc.), which could be delegated to AI solutions. The experts expect AI to “save more time than it generates (additional) administrative tasks”. For algorithms and other current data processing solutions that is often the other way around. Also, due to the mass of information and price points, some pricing methods such as dynamic pricing are much more straightforward and more effective if done automatically. Therefore, a company that moves fast and manages to implement AI solutions in their systems can benefit from a competitive advantage in pricing as long as others are still struggling. Above all, internationally active companies that supply global markets can derive benefits from AI since it enables instant and round-the-clock attention. One major decision to take is whether standardized solutions can be used or whether AI solutions must be tailored or even built in-house to individualize them. The companies that regard AI as a required capability in itself (in the resource-based sense) are on a good path to benefitting from competitive advantage.

### 5.2 The impact of AI on pricing will be evolutionary and vary in speed and extent depending on the industry

“For consumer goods, for instance, I believe it is a time horizon of 5 years before it [AI] is generalized.” (Respondent F)

As mentioned above, not every company has the fundamental infrastructure to implement AI. Some industries might be better prepared than others. The pricing experts described several factors which make an industry more likely to implement AI technologies in

pricing. Among these factors are: huge amount of standardized transactions, predictable variables (e.g., demand or revenue), market environment that allows for (largely) free price setting (thus, the public sector is exempted), mainly standardized products and services (or bundles), data-driven industries (straightforward linkage to existing systems).

The airline business, banking, fintech as well as online retailing were named as the initial implementation environments. In contrast, industry sectors with a high relevance of ethical information procurement and decision-making were considered less amenable to AI technology implementation. Innovation pricing was regarded as fundamentally different and complex, thus making AI solutions hard to use. The most benefit is seen in price prediction, price elasticity estimation and simulation models.

### **5.3 The social aspects of the implementation of AI in the field of pricing will be far more challenging than the technical ones**

The experts agreed that the most crucial obstacle to AI implementation is not represented by the technical aspects and the development of fitting solutions. Rather, the “social implementation” of AI is seen as a key challenge. No matter how helpful AI might be for managers, the following aspects have to be taken into account: company culture, fear of change, fear to take the decision for or against AI implementation, which tasks will be delegated to AI, mistrust towards machine-centered analysis/decisions, managers’ assessment of their own skills and the machines’ skills, responsibility and liability aspects of decisions (Will managers like to give away the responsibility? Or do they even tend to overuse and trust AI too far?). The experts predicted a negative correlation between the value placed on company culture and the speed of AI implementation.

### **5.4 AI will render the long-desired objectification of price setting (decisions) possible**

“There will surely be an evolution, but no disruption.” (Respondent G)

All our experts agreed that the use of AI technology will allow for completely objective decisions. Whether this kind of decision-making is desirable and successful in the market is another story (which will get back to in section 6). In any case, AI will definitely be helpful in documenting and replicating decision-making processes in price setting, which has so far often been difficult (people applying their own decision rules, tacit knowledge, relationship-based decisions, etc.). This will allow companies to maintain a constant level of professionalism in price setting, creating benefits, above all, for companies with a high staff turnover in the pricing department.

AI is expected to be more objective in weighting data, extracting value from data, and exploiting all the potential of big databases, than pricing managers are. Furthermore, it will be much more efficient in separating the socalled signal from the noise, which describes the separation of useful and relevant data from the collective dataset. Therefore, finer, more dynamic and faster data analysis and price setting will be possible. AI will also be faster and more efficient in adjusting to new circumstances and additional data than pricing managers using their traditional routines and heuristics. Although some factors that may have an influence on prices (e.g., external factors such as the environment) are expected to be hard to grasp for AI, even in those cases decisions are considered to improve through AI. At the very least, AI technology is expected to allow for more informed choices.

## 5.5 The roles of pricing managers and of AI within one pricing system

The experts were not unanimous in their opinion on how AI will change the role of the pricing manager within the price setting system. Also, there were diverging predictions on how pricing decisions will be taken in the future. Regarding this subject, which seemed of utmost importance to the experts judging by the nature and the extent of their answers, two debated questions could be derived.

### a. When it comes to pricing decisions, who is the better decision-taker – AI or the manager?

The experts revealed diverging views on decision taking in pricing, i.e. they disagreed on their evaluation of the human factor.

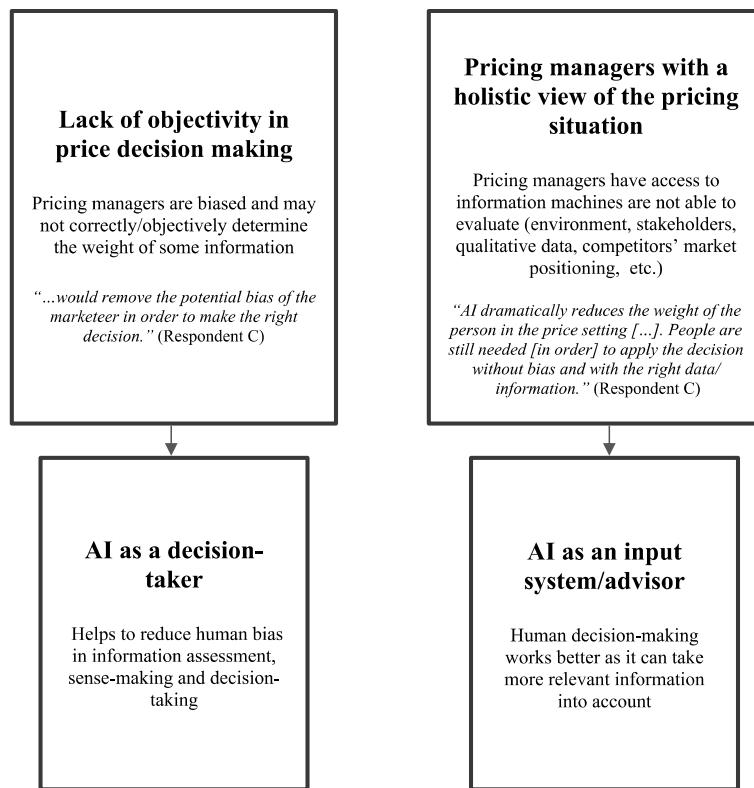
Pricing managers may be regarded as biased (cf. *Tversky/Kahneman*, 1974) because they make use of experience, gut feeling and heuristics and are supposedly not able to correctly determine the weight every piece of information should take in the pricing decision. Therefore, AI is seen by some as a tool that increases objectivity and is able to take over pricing decisions. Supporting arguments include the flexibility of AI, whereas managers tend to be set in the way they see things (status-quo bias). Furthermore, AI is better suited for unplanned decisions and ad hoc pricing.

The other point of view assumes that pricing managers have a broader view on the decision environment based on expert knowledge and thus can grasp information AI would not be able to assess correctly. Therefore, they suggest that gut feeling, intuition, heuristics and experience are crucial to decision making in pricing (cf. *Gigerenzer/Gaissmaier*, 2010) and AI is only a supporting tool that helps provide relevant information. Arguments brought to the table comprise the discrepancy between internally available and externally (often) not available data, between the qualitative and quantitative nature of data, the value of tacit knowledge and the importance of ethical pricing.

In the medium run, the specific understanding of pricing managers and their potential will determine whether AI will be employed in decision-taking, support decision-taking (as an input source, a zero baseline for every manager in the firm, or for advising agent) or be a decision-taker itself (see *Graph 1*).

### b. In the face of AI the role of the pricing manager within the pricing system will change – but to what degree and in which specific characteristics?

Established literature proposes skills, know-how, routines and coordination mechanisms which come into play during the pricing process of a company and which pricing managers therefore should embody (Dutta et al., 2003). The experts agreed that the role of the manager will change in the face of AI. They disagreed, however, on the questions to which degree it will change and which characteristics will specifically be more important or lose their importance. Therefore these specific points of disagreement are treated in detail in the next chapter.



Graph 1: Two streams of potential for AI in pricing

## 6. Results – second round

“[If] the development of AI will drive a complete change in how prices are defined, the change will be more important as the role / purpose of pricing itself might change.”  
(Respondent C)

The second round focused on the diverging views on AI in pricing. In order to analyze in more detail and to synthesize the opposing views from the first round, we specifically asked the experts about managers' roles, skills and tasks. According to the major characteristic of Delphi studies, this second round resulted in a more detailed picture of experts' predictions of pricing in the face of AI: The further consensus in combination with a detailed picture of pricing as a capability are presented as our results in the following.

In order to structure the results, we followed *Dutta et al.*'s (2003) proposal of the pricing process as a capability, where, following the literature on resource-based approaches (e.g., *Wernerfelt*, 1984; *Peteraf*, 1993; *Teece et al.* 1997), they state that “The price-setting process is a capability based on a combination of routines, coordination mechanisms, systems, skills and other complementary resources that are difficult to imitate” (*Dutta et al.* 2003, p. 619).

Pricing Process Activities	Searching and making sense of information	Price strategy	Price Setting: Translating strategy into price	Price enforcement (internal/external)	Price controlling
Routines	<ul style="list-style-type: none"> <li>Identify competitor prices (defining functionally equivalent products, price database, tracking product changes, accessing competitive price information) (Dutta et al. 2003) <input type="checkbox"/></li> <li>Estimate customer KPIs (e.g. willingness to pay) (Homburg et al. 2004; Reinecke, 2020) <input type="checkbox"/></li> <li>Estimate market KPIs (demand, costs etc.) (e.g. Lancioni, 2005; Kotler et al. 2017) <input type="checkbox"/></li> <li>Collect price related information (Dutta et al. 2003) <input type="checkbox"/></li> <li>Price analysis (Tortzok/Alavi, 2010; Homburg/Tortzok, 2011) <input type="checkbox"/></li> </ul>	<ul style="list-style-type: none"> <li>Decide on a pricing strategy &amp; revise it according to the different market situations <input type="checkbox"/></li> <li>gather market research information if necessary <input type="checkbox"/></li> <li>simulate market responses engendered by different strategies <input type="checkbox"/></li> <li>define short, middle and long term price strategy goals (Reinecke, 2020) <input type="checkbox"/></li> </ul>	<ul style="list-style-type: none"> <li>Provide uniform information base for advisors and decision makers <input type="checkbox"/></li> <li>monitoring portfolio price harmony <input type="checkbox"/></li> <li>assessing (added) value of single features <input type="checkbox"/></li> <li>defining the weight of different items of information <input type="checkbox"/></li> <li>Final list price discussion in the responsible teams <input type="checkbox"/></li> <li>check the concordance of list prices with the strategy <input type="checkbox"/></li> <li>set pricing corridors <input type="checkbox"/></li> <li>Final list price decision or approval (Dutta et al. 2003) <input type="checkbox"/></li> </ul>	<ul style="list-style-type: none"> <li>Communicate pricing decision to other BUs and subsidiaries <input type="checkbox"/> implement them into the organizational software <input type="checkbox"/></li> <li>Estimating margins and real rebates <input type="checkbox"/></li> <li>Derive feedback for future price setting (Homburg et al. 2004) <input type="checkbox"/></li> <li>Evaluate feedback and enable potential ad hoc measures <input type="checkbox"/></li> <li>Support argument base for sales and customers (Dutta et al. 2003; Reinecke, 2020) <input type="checkbox"/></li> <li>publish new list prices <input type="checkbox"/></li> <li>price negotiations (Diller, 2008; Voeth/Herbst, 2011, 2015) <input type="checkbox"/></li> <li>external price enforcement is a task mostly covered by sales staff (Belz et al. 2011; Homburg et al. 2012) <input type="checkbox"/></li> </ul>	<ul style="list-style-type: none"> <li>(Price) monitoring of Sales, the own retailers (Kunold/Antolin, 2011) <input type="checkbox"/></li> <li>Derive feedback for future price setting (Homburg et al. 2004) <input type="checkbox"/></li> <li>Evaluate feedback and enable potential ad hoc measures <input type="checkbox"/></li> <li>Database &amp; research skills <input type="checkbox"/></li> <li>analytical skills for price developments and outliers <input type="checkbox"/></li> <li>sensemaking of statistical findings and translation into recommendations <input type="checkbox"/></li> <li>strategic thinking <input type="checkbox"/></li> </ul>
Skills/Know-How	<ul style="list-style-type: none"> <li>Product knowledge</li> <li>Methodology skills (e.g. WTP assessment)</li> <li>Statistical analysis (e.g. demand estimation)</li> <li>Database management</li> <li>Retrieving tacit knowledge of other BUs e.g. Sales staff about customer reactions</li> <li>Information management: Relationship management, organizational and hierarchical</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge of existing pricing strategies (usage, effects &amp; implementation)</li> <li>Market research tools &amp; possibilities</li> <li>Simulation methods, Scenario analysis</li> <li>price sensitivity (technical &amp; tacit knowledge on customer response)</li> </ul>	<ul style="list-style-type: none"> <li>analytical skills information processing &amp; presentation “seeing the bigger picture” (with respect to product portfolio and variety in subsidiaries/countries etc.)</li> <li>Objectivizing the added value of products</li> <li>Organizational decision taking</li> <li>Mediation &amp; conflict resolution</li> </ul>	<ul style="list-style-type: none"> <li>Price communication and presentation <input type="checkbox"/></li> <li>Knowledge of pricing mechanisms and customer reactions <input type="checkbox"/></li> <li>Argumentation &amp; justification skills (Knowledge of price setting, reasons for decision and argumentation for sales &amp; customers) <input type="checkbox"/></li> <li>Internal pricing education skills (e.g. Sales)</li> </ul>	<ul style="list-style-type: none"> <li>Database &amp; research skills <input type="checkbox"/></li> <li>analytical skills for price developments and outliers <input type="checkbox"/></li> <li>sensemaking of statistical findings and translation into recommendations <input type="checkbox"/></li> <li>strategic thinking <input type="checkbox"/></li> </ul>

Pricing Process Activities	Searching and making sense of information	Price strategy	Price Setting: Translating strategy into price	Price enforcement (internal/external)	Price controlling
	<u>Know-How, evaluating reliability of information, structuring information and knowledge transfer</u>			<ul style="list-style-type: none"> <li>■ Mediation skills in case of conflicting interests</li> <li>■ Management of and empathy for involved organizational parties (assessment of seriousness of complains)</li> </ul>	
Coordination Mechanisms	<ul style="list-style-type: none"> <li>■ Cross-functional information gathering (e.g. teams)</li> <li>■ coordination of the (ta-cit) knowledge management in sales</li> <li>■ coordination of knowledge between sales force and their customers</li> </ul>	<ul style="list-style-type: none"> <li>■ Developing consensus about different expert opinions on customer reactions</li> <li>■ Incorporate overall and long-term strategies of the company into pricing strategy (coordination with strategists, c-level management etc.) (growth, penetration, stance on innovation etc.)</li> <li>■ Developing consensus on conflicting strategic goals</li> </ul>	<ul style="list-style-type: none"> <li>■ Cross-hierarchical advising, decision taking &amp; approval</li> <li>■ Coordinate knowledge and information base</li> <li>■ Coordinate &amp; define the decision hierarchy and involved entities, roles and people</li> <li>■ Organize their discussion and decision taking</li> <li>■ International price harmonization and coordination (e.g. Homburg/Totzek, 2011, p.52)</li> </ul>	<ul style="list-style-type: none"> <li>■ Coordinate feedback from subsidiaries or other BUs</li> <li>■ Coordinate potential price correcting measures</li> <li>■ Coordinate &amp; organize special permissions for single contracts or special markets</li> </ul>	<ul style="list-style-type: none"> <li>■ Feedback mechanisms to pricing decision takers</li> <li>■ fast and agile processes (e.g. to correct wrong or suboptimal prices) (Pepels, 2006, p. 14)</li> </ul>

**Table 1: Summary of routines, skills/know-how and coordination mechanisms along the price-setting process**

Extensive desk research led to a summary of routines with regard to pricing processes and identified the potential for professionalization. From the identified routines we deduced the required skills that a pricing manager, team or business unit should possess, thus extending *Dutta et al.*'s list of requirements to develop pricing as a capability. The results are summarized in *Table 1*.

AI might further develop in the upcoming decade within the previously mentioned state of "hybrid AI". However, its application in the field of pricing within the upcoming five to ten years is a change process and depends on which roles companies attribute to AI. When comparing the results of our Delphi study with the routines, skills and coordination mechanisms found in the literature, three general tendencies of AI's role in pricing may be discerned:

1. The experts predict that AI's highest potential in pricing will consist of taking on routines.
2. Skills/Know-how of pricing managers will therefore shift to sense-making, decision-taking, strategic thinking and managing people and the pricing culture. Therefore, pricing managers will concentrate on some activities of the pricing process and will not generally be in charge all along the process.
3. Coordination mechanisms cannot be worked out by AI solutions as they highly depend on (social) incentives and human relationships. However, AI can support the coordination and streamline it, minimizing managers' effort and thereby improving their output. In this reasoning, AI could even act as a separate player within the coordination tasks.

These aspects will be discussed in more details in the following sections.

## 6.1 Routines

The experts consider routines to hold the highest potential for AI technology implementation in pricing and therefore they predict the biggest changes in pricing in the area of routine tasks. In *Table 1* the routines that will potentially be within AI's scope are indicated by . As *Table 1* shows the majority of routines falls within AI's capabilities except for routines that involve relationships and/or empathy and deal with predominantly qualitative and unstructured data (e.g. gathering competition price information in B2B markets). Furthermore, experts consider strategic decisions to be a management task which AI can support through its computational power.

## 6.2 Skills/know-how

In general, the experts predict two different directions in which pricing managers' skills should be developed: they will need either analytical skills and programming know-how or a focus on soft skills, relationship building and strategic thinking. This implies the evolution of two different types of pricing managers: the analyst and the strategist. Therefore, according to the experts, the role of a pricing analyst will change even more radically compared to other management positions in marketing. This implies that, if companies are willing to make use of the full power of AI, pricing managers will have to be strategic thinkers and networkers. They will have to build bridges between company knowledge, tacit knowledge and unstructured information (sources) on the one hand, and to the in-

formation structuring and processing machine on the other hand. Therefore, their required skills and know-how will have to adapt to AI. In *Table 1* the skills and know-how which shall be the focus of future pricing managers are indicated by underlined script. According to the results of this research project, these skills should be at the center of pricing managers' education (mixture of curricula, trainings and internships). Therefore, we provide implications and recommendations deduced from our results in the following.

Regarding management education, the first recommendation is to highlight the importance of pricing strategy. Pricing strategy is not just a sub-topic within marketing but rather a cross-functional and therefore a company-wide endeavor. (Totzek/Alavi, 2010; Narver/Slater, 2012) With AI playing an ever growing role in pricing, the qualities and skills of a pricing manager will reside in coordination, communication, bridging the offline and the online world, networking and building relationships with other roles/functions and possessing a wide and detailed knowledge of the specific products and their added value.

### 6.3. Coordination mechanisms

Coordination mechanisms offer room for broader discussion as they require a diverse set of skills. Establishing a consensus, for example, seems to be a typical management task, which can hardly be taken on by AI. The task itself requires a set of diverse skills such as conflict resolution, data sense-making, argumentation, negotiation and emotional intelligence. But, on the other hand, coordination that relies on information processing and collection, would in fact be easier and faster when supported or executed by an AI solution. Combining our findings with existing literature, we identified three ways in which AI may assume a place within the coordination mechanisms of pricing tasks:

1. AI technology will become a separate player and have certain tasks for which it is solely responsible (like a team member in cross-functional teams) (see *Seeber et al. 2018*).
2. AI will act as a platform for information and knowledge to be shared and processed, accessible to all stakeholders.
3. AI will filter and channel information in order to improve the information base for pricing decision-takers.

Paradoxically, we found that the potential of AI will be strongly dependent on the decisions human managers will make. As in a self-fulfilling prophecy, their opinion of AI's potential and their attitude towards future AI disruption determine the role AI is going to take on in the future – i.e., which one of the three options of collaboration will be realized. The fullest potential and the strongest competitive advantage will be realized by those who aim at AI being a new player at the table.

### 7. Limitations & further research

One might suspect a bias among people active in pricing in favor of the benefits of the human role and a certain fear of being superseded by AI solutions. Although all the pricing managers in our sample showed an open-minded and rather pragmatic attitude towards the changes due to AI technology, we assume that other participants, e.g. consultants, might be less prone to a biased view of the future, since their jobs will be less dependent

on the role of AI within pricing. But despite any bias, all pricing managers should be able to assess the capabilities of machine-supported pricing, which is why we included a question regarding machine and management tasks. Furthermore the Delphi study is designed to exchange and synthesize expert opinions. One might assume that experts try to argue as realistically and objectively as possible in order to maintain their expert reputation throughout the direct comparison of their colleagues' assessments. Nevertheless, it would be interesting to extend the Delphi study design to CEOs and managers responsible for corporate strategy planning to establish a more holistic model.

Another interesting question arises from the differences between B2B and B2C pricing. With price negotiations and a dispersed authority regarding pricing decisions, B2B pricing entails more routines and more coordination mechanisms. We suppose that here the challenges and effects of AI will be especially strong, that, however, the basic rules we found in the present study will hold throughout. In order to prove this, the study would have to be replicated with a B2B-specific sample.

Finally, it would now be useful to determine which type of managers will be willing and able to unleash the full potential of AI solutions. What is the skill set necessary for efficiently using the right amount and type of input in pricing and forming the best pricing teams of the future?

## 8. Conclusion

Summarizing the presented results, it can be concluded that the field of pricing holds much leverage to be exploited by an adequate implementation of AI solutions. The first movers will be able to garner the related competitive advantage and engender great benefits for their companies. Therefore, a thorough implementation and fast adaption will lead to considerable advantage in the market. In the long run, however, AI solutions will become the new standard. Company strategists, human resource specialists as well as marketing and pricing managers are well advised to prepare thoroughly for these changes. In this context, we propose that understanding and implementing AI should be seen as a separate capability within a company rather than "just" a further management objective or process-supporting tool.

The importance of soft skills, moderation, consensus seeking and empathy will increase although there will be more machines involved in the pricing process. This may seem paradoxical as in the short run the potential for competitive advantage clearly lies within the technical implementation of AI solutions. However, in the long run, when AI solutions will be the standard, companies' x-factor might actually be the skills managers bring to the table. AI will sooner or later lead to a high degree of standardization within pricing processes across companies due to easy access and implementation of solutions. The "human factor", which is sometimes unpredictable and which machines are not completely able to account for due to individual and circumstantial judgments, will remain an important black box companies can use for differentiation.

For now, technical skills are the main source of competitive advantage: however, in about ten years' time (as estimated by the experts), the capable human manager (strategic thinker, sense-maker and empathetic leader) will supersede and become the long-term competitive advantage of any firm. Good and precise pricing will be possible without any manager involved, but investments in human pricing capabilities will make the crucial difference.

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