THE USE OF HEURISTICS IN BUSINESS DECISIONS

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ABSTRACT
In today's business environment, the game changes incredibly fast, new types of challenges arise more and more often, assessing unfamiliar context and making decisions under uncertainty becomes a daily routine for any manager. Therefore, heuristics (viewed as simple decision-making algorithms) can be a useful tool for many categories of business professionals. This paper provides a review of the different ways that the scientific community analyzes heuristics in business, focusing particularly on the conscious (rational) vs. unconscious (irrational) approach; it draws upon the analogy between heuristics, proverbs and memes (as defined by Richard Dawkins) in their capacity to replicate and adapt; it also discusses, based on a narrow scope research on Romanian business professionals, the limits of heuristics and also the favorable conditions under which heuristics can become decision rules shared throughout the organization.

KEYWORDS: *decisions under uncertainty, heuristics, memes, policy*

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1. INTRODUCTION

When it is cold outside, it is difficult for a runner to decide what to wear for a long run. Too many layers and she will either overheat or need to carry the extra clothes in her hand or around her waist. Too few layers and she will be cold and risk muscular or joint injury. Before starting, the runner does not know how her choice of clothes will perform in the heat of training, so she lacks knowledge. In the middle of training, she knows for sure that she is too cold or too hot, but has no closet at hand, so she lacks agency. So, how should runners decide how to dress for a winter run? Well, they can keep a journal logging weather, dress code, and satisfaction after each run, and consult it. But that would be too laborious. Instead, the running community uses a heuristic, a popular rule of thumb: dress as if it were 10 degrees warmer.
Harry Markowitz received the 1990 Nobel Memorial Prize in Economic Sciences for inventing the Modern Portfolio Theory. Based on mean-variance analysis, this method evaluates investment funds and facilitates mathematical-based algorithms for allocating a portfolio among a range of investment vehicles. When he retired, Markowitz decided to place his savings in a number of funds. Did he use his own Nobel-Prize-awarded algorithm to decide how much of his savings to allocate for each fund? No. Instead, he allocated the same sum for all funds (a heuristic named 1/N), arguing that, sometimes, complex algorithms induce larger errors, so it is better to simplify.
I used these two heuristic examples to colorfully introduce the topic of this paper. This paper approaches heuristics in business from three different, but interrelated inquiry points: 1. What is the view of the scientific community on heuristics and what role do they play in business decisions? 2. When is it safe to use heuristics and what are some limitations in this sense? and 3. How do heuristics appear and how do they spread? For the last point, this paper gathers a list of heuristics used in different fields of management.

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2. OBJECTIVES AND METHODOLOGY OF RESEARCH

The aim of this paper is to analyze the use of heuristics in modern management decisions. Two objectives lead to this aim: to establish recommended conditions of use and to propose a simple model of the life of a heuristic. The main method employed is literature review, but I have also used interview-based qualitative research. The unstructured interviews were performed amongst Romanian business professionals and focused on three questions: "Do you know any heuristics used in your industry?", "What is your professional opinion on them? Do you use them?", and "Where did you learn about these heuristics?"

3. HEURISTICS IN BUSINESS – A SHORT REVIEW

The current business environment is characterized by an increasing pace of change. The environment in which a manager must make decisions is less and less predictable, making "uncertainty a defining characteristic of managerial decision making" (Artinger et al, 2014). Another characteristic of today's management is the need to make decisions under a chronic lack of time.

With too little time on their hands and an unreliable forecast of the near future, managers are turning to simple decision-making algorithms called heuristics. These methods, learned by experience, are "mental shortcuts used to ease the cognitive load of making a decision or finding a satisfactory solution (not an optimal one) for a problem" (Abreu, 2014).

Definitions and dialectics. Scholars generally agree on the definition of heuristics as "thumb-rules guiding decisions" (Manimala, 1992). Kahneman and Tversky (1974) speak about heuristics as decision tools that "reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations". But even from the defining paragraphs one can observe two opposing schools of thought. Kahneman (2011) defines a heuristic as "a simple procedure that helps find adequate, *though often imperfect*, answers to difficult questions". Gigerenzer and Gaissmaier (2011) define a heuristic as "a strategy that ignores part of the information, with the goal of making decisions more quickly, frugally, and/or *accurately* than more complex methods." Logically, these statements do not contradict each other (a method that is often imperfect can be more accurate than other), but the fallacy of accent in these definitions and in the subsequent literature of the two schools makes one view heuristics as either source of error, or source of efficacy.

In Kahneman and Tversky's view (1974), heuristics are viewed as a source of error: "in general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors.", always associated with biases (the name of the quoted article is "Judgement under Uncertainty: Heuristics and Biases", 1974, also Part 2 of "Thinking, Fast and Slow" is titled "Heuristics and Biases"). In short, the proponents of the heuristics and biases research program interpret the use of heuristics as a weakness of human judgement.

On the other hand, Gigerenzer and his co-authors see the use of heuristics as an evolution-shaped strength, they view heuristics as efficient decision-making tools that do not always sacrifice accuracy for speed, economy or comfort, but sometimes provide results as good or even better than elaborate methods.

What should a modern manager do? Keep away from heuristics, as they were shown to lead to bias and error? Or embrace them, in hope for optimal results? As always, the answer is: "It depends".

The two schools of thought give multiple examples of heuristics. As expected, Kahneman and Tversky emphasize the errors, while Gigerenzer and collaborators observe the high efficiency and accuracy. The list presented in the "Heuristics and Biases" chapter of Danny Kahneman's famous book "Thinking, Fast and Slow" includes: anchoring (the tendency to rely too much on the first piece of information encountered), availability bias (estimating the size of a category or the frequency of a phenomenon by the ease with which instances come to mind), bad statistic

inferences (ignoring the base line, using samples that are too small), and others. Examples of successful heuristics given by Gigerenzer and collaborators include: the hiatus heuristic (retailers ignore other data and classify customers as inactive if they haven't purchased for a number of months), recognition heuristic (choosing the option that sounds most familiar), tallying (ignoring beta weights is as good a predictor as multiple regression), with its variant 1/N (allocate resources equally among projects, the way Mr. Markowitz allocated his retirement funds), and others.

Heuristics can be analyzed by discussing two trade-offs: the accuracy-effort trade-off and the bias-variance trade-off.

The accuracy-effort trade-off. The original view on heuristics was defined by this trade-off. Effort (money, time, computation, information gathering and processing, work in general) is costly, so managers sacrifice the quality of the decision to make it faster and using fewer resources. Plus, a good decision today is better than a perfect one tomorrow. But several researches proved that heuristics do not always result in poor (-er) outcome. In many documented cases heuristics provide results as good or even better than complex methods. Let us see some examples of both cases:

Documented inaccurate heuristic – **The Availability Bias**: People mistakenly judge salient events as being more frequent. In a grim research paper, Lichtenstein et al (1978) shows, among other misperceptions, that death by accident was judged by respondents as 300 times more likely than death by diabetes. In reality, death by accidents occurs 4 times *less often* than death by diabetes.

Documented accurate heuristic - **The Hiatus Heuristic**. Retailers usually gather a lot of data on their clients. They know the customer's purchase history (value, content, time, frequency), they also have an accurate profile of the customer (socio-demo-psychographics). And they need to know with a certain degree of confidence whether a customer is active or inactive. There are three reasons for this need: a) identify profitable inactive customers that are worth reactivating; b) remove unprofitable inactive customers from the list; and c) identify active customers to be targeted with commercial communication (Wübben and Wangenheim, 2008). There are complex methods that use all or most of the data available to answer this question, but in real life, all over the world, retailers use only one criterion: the time passed from the last purchase. If this time is greater than 9 months (an apparel retailer and an airline) or 6 months (online CD retailer) or 12 months (Emag, a Romanian online retailer), then the customer is labeled as inactive. So, what do retailers sacrifice by ignoring such a large spectrum of data? Apparently, nothing. According to Wübben and Wangenheim (2008), when compared with a complex method (a method called Pareto/NBD model), the hiatus heuristic performed better in two cases (correct identification of inactive customers in 83% and 77% of cases, vs. 75% and 74%, respectively, with Pareto/NBD) and as good in the third (77% both).

Documented accurate heuristic - **The Recognition Heuristic**. In their book "Simple Heuristics that Make Us Smart" (1999), by Gigerenzer, Todd and the ABC Research Group, the authors describe an experiment in which they have built investment portfolios based on the familiarity of the company name. They have asked separate groups of German and American pedestrians (lay people) and experts to indicate which companies they recognized from the NY Stock Exchange and several German stock exchanges. Then they have built portfolios of the best recognized companies in various combinations (pedestrians recognize local names, foreign names, experts recognize local names, foreign names). After 6 months, they compared all these portfolios with the market indices and with managed funds. To spice things up, Gerd Gigerenzer decided to "put his money where his heuristic was" and bet a "nontrivial sum of his savings" on German stocks recognized by Munich pedestrians. To his academic and financial pleasure, he discovered that recognition-based portfolios have beaten the market in all instances. However, I must stress that further confirming research has not been performed since, to my knowledge. The authors themselves emphasize the need for further studies, under different market conditions, as the extremely bullish aspect of the 1997 markets may have favored large (and thus recognizable) companies.

Accuracy relativism: The three examples above described the results of heuristics versus something else (reality, complex methods, market indices). In a 1992 research paper, Manimala studied how

the use of various heuristics correlates with innovation in entrepreneurial management. For this purpose, he devised a list of 186 heuristics and sometimes one can find through the list pairs of heuristics that describe perfectly opposed management strategies (Example: "Don't put all your eggs in one basket", versus "Put all your eggs in one basket and concentrate your efforts on them so that they hatch"). Obviously, there is no need to further see how these heuristics perform. If one does, the other one doesn't. The fact that they are opposed says enough about their accuracy.

Discussion. It is possible that, perhaps without intent, scholars from the two opposing schools may have gathered mostly examples of heuristics that confirm their views (biased vs. accurate). However, by presenting examples of both inaccurate and accurate heuristics, and examples of perfectly opposing heuristics (so that, in a certain context one is obviously more accurate than the other), we can reach the conclusion that heuristics can be, at least sometimes, accurate decision tools. When? And how can we devise some basic guidelines for using them? In order to answer these questions, it is useful to analyze the other trade-off.

The bias-variance trade-off. If we are presented with a management situation where a decision must be taken based on given information, we try to build a good model, hope that the model has predictive power, and use the predictions to choose the best decision. Gathering and processing all the available data is effortful and time-consuming, this has been discussed in the accuracy-effort trade-off paragraphs. However, even if data is readily available and easy to compute, fitting all of it into a model is dangerous. The more a model is complex, with many parameters, the greater the variance, creating confusion between noise and signal and failing to predict accurately. This is especially true for smaller sets of data, or when less relevant parameters are included in a model.

This is why it might be better to prune a model and ignore on purpose some of the available data, in order to reduce variance. Of course, this will skew the results, creating bias. There is a sensitive balance between bias and variance. The more data we consider, the more variance. The more data we ignore, the more bias. And both variance and bias produce error, as total error is a sum of bias (squared), variance and noise. So, the best model is not too complex, but also not too simple. This feature has been defined as the **less-is-more effect**: "there is an inverse-U-shaped relation between level of accuracy and amount of information, computation or time" (Gigerenzer and Gaissmaier, 2011). **Figure 1** illustrates this U-shaped relationship. Therefore, "there is a point beyond which greater information, computation capacity or time availability are not beneficial, but are, to the contrary, detrimental to the ability to reach successful decisions." (Guercini, 2012) Where is the sweet spot? There is no analytical method to determine that. Buts surely the optimal complexity is one that allows for some bias and may ignore some data.

So, when can we rely on heuristics?

a. **Intent.** The main difference between the two academic perspectives described before is intent. In Kahneman and Tversky's view, a heuristic is a rule of thumb that is applied without much consideration. In Gigerenzer's view, although it is still a rule of thumb (an algorithm that computes less), it is a rule that can be purposefully selected by an experienced manager from a larger collection of algorithms, after careful consideration. Obviously, when used in this fashion, heuristics are more effective.
b. **Environment**. Gigerenzer et al. (1999) emphasize that heuristics cannot function as universal rules. "Heuristics are successful to the degree they are ecologically rational, that is, adapted to the structure of the information of the environment in which they are used to make decisions." The key feature of the environment is uncertainty. Heuristics perform better in decisions under uncertainty, not in decisions under risk. Artinger et al. (2014) found 3 conditions under which heuristics are preferable to more complex algorithms: "greater predictive uncertainty, relatively small sample size, and less stable environment."
c. **Experience.** In her article "Intuition versus Reason", the philosopher Berit Brogaard (2017) describes how chess champions store in their long-term memory over 300.000 positions of the pieces on the board. Unlike a novice, who analyzes piece by piece, they recognize these patterns and apply, by instinct, the appropriate solution. But that instinct is based on

extensive experience. Similarly, an experienced manager would recognize better the appropriate environment and the appropriate timing for using an a certain heuristic from her well-assorted heuristics toolbox.

d. Specificity and convergence. In management, heuristics can be field-specific or can be general, suited for a large spectrum of industries and activities. It is also the manager's job to assess whether she can apply or adapt a certain heuristic in a certain domain. Also, a heuristic can be well disseminated in the respective field (convergent), or can be distinctive (known or applied by just one individual or in only one organization). A large dissemination can certify the validity of a heuristic, but can also diminish its effectiveness - as more competitors use it, the company where it originated from loses its competitive advantage (Guercini, 2012).

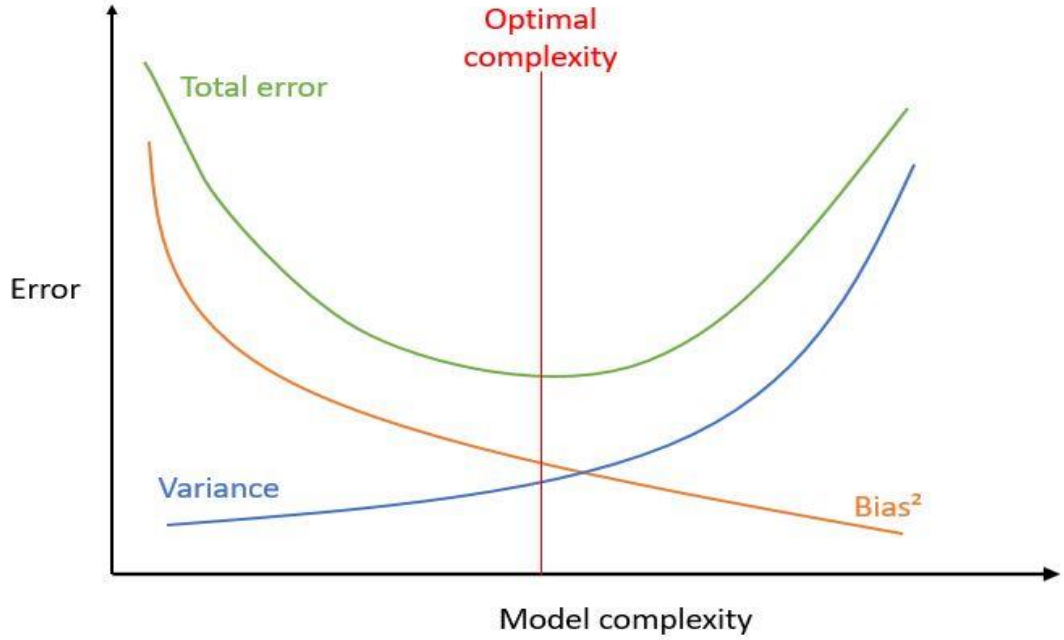

Figure 1. The bias-variance trade-off
Source: Adapted from Fortmann-Roe, S. (2012)

4. FROM HEURISTIC TO POLICY

Heuristics are like proverbs. Sometimes, heuristics **are** proverbs. Manimala (1992) gathered a collection of 186 heuristics used by entrepreneurs. A lot of them are, in fact, proverbs: "Don't put all your eggs in one basket", "Where there's a will there's a way", or play on existing proverbs: "Timing is money". Proverbs are in fact heuristics: short decision algorithms to be used when necessary.

The term "meme", famous now because of pictures of cats with funny captures, was actually invented in 1976 by Richard Dawkins. In his famous book "The Selfish Gene", after explaining throughout the text how genes spread, Dawkins brainstorms in a final chapter about what other *replicators* can act similarly. And he realizes that pieces of information (ideas, jokes, songs, proverbs, theories, fashion, etc.) can be considered this way, because they **self-replicate** (a funny joke spreads fast from person to person), they **mutate** (Frank Sinatra's "My Way" was adapted from the French song "Comme d'habitude" and became much more popular), and they **respond to selective pressures** (memes that propagate less become extinct, like Marx and Engels' "Workers of the world, unite" in Eastern European Millennials and Post-Millennials). And he called them

"memes". There is a whole science, called memetics, born in the 1980s, that studies the evolutionary model of information transfer based on the concept of meme. As in genetics, the success of a meme is related to its contribution to the host's effectiveness.

Heuristics and proverbs are perfect examples of memes. They are born from a person's experience, they are continuously polished by repeated use, they spread within the community, and are then adapted for other communities. They are closely dependent on the environment. The most successful ones spread more than the less applicable.

If we were to explore the meme nature of heuristics, two aspects become interesting: how do they come to life, and how do they spread? In order to do this, I have asked a number of professionals to give examples of heuristics that they use or heuristics that are generally used in their industry. The list continues below:

1. Marketing: **"In a marketing campaign, do not spend on research more than 5% of the campaign's budget."** Explanation: The research budget for a campaign can vary widely and there is a tendency to spend too much on research. This rule of thumb limits it to 5%. A variant of this heuristic limits the research budget to the product/industry margin, making the heuristic usable across industries.
2. General Management: **"If there are 3 ifs, don't do it!"** Explanation: If a project requires 3 different conditions to be met, the risk of failure is too high. For example, if the 3 conditions are independent and their respective probabilities are all equal to 0.5, the probability that all conditions are met is 0.125.
3. Investment: **"Never catch a falling knife."** Explanation: Do not buy shares when the price is in free fall, because it does not matter how low they have gone, the trend can continue. Buy only after the price seems stable.
4. Investment: **"Sell in May and go away."** Explanation: Generally, summer months are slow.
5. Investment: **"In stock/bonds allocation, subtract your age from 100 - and that's the percentage of your portfolio that you should keep in stocks."** Example: If you are 30, you should keep 70% of your portfolio in stocks. If you are 70, you should keep 30% of your portfolio in stocks. Explanation: The risk of the portfolio should decrease with age. However, the investment banker who supplied this heuristic criticized it for working with percentage of portfolio, instead of contributions to the total risk of the portfolio. Apparently, percentages are not the best proxy for contributions to risk.
6. Investment: **"Own Your Age in Bonds" (OYAIB)**. Explanation: This rule says that the percentage of bonds in your portfolio should equal your age. It is obviously a variant of the rule above, but it is mentioned here separately because of its popularity (it has its own acronym in the investment literature).
7. Retail – Shopping Malls: **"Rent should be less than 25% of sales for generic stores and less than 10% of sales for IT and electronics stores."** Explanation: Shopping malls operators want to make sure that retailers will afford to pay the rent and they check prospective clients by using this rule of thumb. The percentage is lower for the IT and electronics because of these retailers' lower profit margins.
8. Telecom - Mobile: **"When on a growing market operation costs should be 15%, on a saturated market they should be 7%."** Explanation: Telecom is an industry with high fixed costs, therefore profitability is reached by keeping operation costs low.
9. Restaurants: **"If rent is more than 4 days revenue, stay out!"** Explanation: A restaurant that operates 30 days a month will not survive with a bigger rent than daily revenue multiplied by 4.
10. Consulting: **"If you pay peanuts, you get monkeys."** Explanation: There aren't good cheap experts on the market, and choosing cheap ones may eventually lead to a loss.

When inquiring about the origin of these heuristics, the answers varied. In most cases, the heuristics acted like established proverbs, known by the whole industry (e.g. the investment ones), some of them were invented/discovered by the professionals themselves, and some were imposed by the

company as policy. One of the respondents stated, for instance, that the mobile industry heuristic ("When on a growing market operation costs should be 15%, on a saturated market they should be 7%.") was imposed by the multinational he worked for to all country branches and that every year the local management had to build the budget based on these limits. What is the journey from a self-discovered rule of thumb to policy?

In his 1992 paper, Manimala tries to define, with the help of Simon, the dividing line between heuristic and policy: "If heuristics are decision rules, how exactly are they different from policies that are often defined as guides to organizational decision-making? The dividing line between a heuristic and a policy is very thin. When a heuristic is accepted and acknowledged as a decision rule, it becomes a policy. Simon (1957) defines a policy as any general rule promulgated by management that limits the discretion of decision-makers. Thus, both heuristic and policy are decision rules, one implicit in actions and the other explicitly stated."

As our local research was quite limited and obviously lacked the possibility to witness the dynamics of the use of heuristics in organizations over time, we can only propose a simple model, based on the organic spread of memes and on the conditions of efficacity discussed above. According to this model, an experienced professional might realize that, in many instances, complex decision models tend to yield results similar to a simpler algorithm (for instance that most successfully budgeted marketing campaigns spend less than 5% on research), makes a simple rule (one criterion) to help him budget in the future, tests it successfully and tells it to his team. At this point, the heuristic starts spreading. It may be then recognized officially by the management and imposed as policy (like the telecom budgeting rule), it may be adapted and borrowed by other industries (the same marketing heuristic, after replacing "5%" with "the product margin"), and it may live on as long as it contributes to its users' effectiveness.

5. CONCLUSIONS

Heuristics became a hot topic in economics in the last few decades, with researchers mainly grouped in two schools of thought. The first group views heuristics as System 1 knee-jerk reactions, inducing bias (and therefore error), sacrificing accuracy for speed and convenience. The second group sees heuristics as useful tools in an experienced manager's toolbox, chosen consciously by System 2 in accordance to the situation (environment), and bringing, along with speed and convenience, even increased accuracy.

A synthesis of literature shows that heuristics can be useful decision-making tools for managers when the managers do it purposefully, are experienced, use the algorithm in accordance to the situation/environment, and when this environment is uncertain, less stable, and providing smaller sample size.

A narrow-scoped research within the Romanian professional environment has provided tens of heuristics (the 10 presented here are just a selection), showing that a lot of industries nurture the birth and spread of such simple decision-making algorithms. The few information gathered about the origin of these various heuristics has prompted the schematic description of a meme-type model of spread. Further research in this direction may confirm or disconfirm the model, refine it, and perhaps make it gain predictive and estimative power on when a heuristic is efficient and is worth becoming policy, aiming to generate policy-making policies in management.

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REFERENCES

Abreu, M. (2014). Individual Investors' Behavioral Biases, *Teaching Economics Working Paper, Universidade de Lisboa.*

Artinger, F., Petersen, M., Gigerenzer, G., Weibler, J. (2014). Heuristics as adaptive decision strategies in management, *Journal of Organizational Behavior,* 36 (S1), S33-52.

Brogaard, B. (2017, March, 2). Intuition versus Reason. *IAI News.*Retrieved September 3, 2017, from https://iainews.iai.tv/articles/intuition-vs-reason-auid-790.

Dawkins, R. (1976). *The Selfish Gene*. Oxford: Oxford Landmark Science.

Gigerenzer, G., Gaissmaier, W. (2011). Heuristic Decision Making. *Annual Review of Psychology* 62, 451-482.

Gigerenzer, G., Todd, P., and the ABC Research Group (1999). *Simple Heuristics that make Us Smart.* New York: Oxford University Press.

Guercini, S. (2012). New Approaches to Heuristic Processes and Entrepreneurial Cognition of the Market. *Journal of Research in Marketing and Entrepreneurship,* 14 (2), 199-213.

Kahneman, D. (2011). *Thinking, Fast and Slow*. New York: Farar, Straus & Giroux.

Lichtenstein, S., Slovic, P., Fischhof, B., Layman, M., Combs, B. (1978). Judged Frequency of Lethal Events. *Journal of Experimental Psychology: Human Learning and Memory*, 4(6), 551-578.

Manimala, M. (1992). Entrepreneurial Heuristics: A Comparison Between High PI (Pioneering-Innovative) and Low PI Ventures. *Journal of Business Venturing*, 7, 477-504.

Tversky, A., Kahneman, D. (1974). Judgement under Uncertainty: Heuristics and Biases, *Science, new series*, 185(4157), 1124-1131.

Wübben, M., v. Wangenheim, F. (2008). Instant Customer Base Analysis: Managerial Heuristics Often "Get It Right". *Journal of Marketing,* 72, 82-93.