Where is Bounded Rationality From?

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Abstract: “Bounded rationality” has become such a key concept that the mere mention of the name “Simon” calls this phrase to mind. Nonetheless, this phrase does not appear in the original text of *Administrative Behavior* (Simon, 1947, 1957, 1976, 1997). In spite of this, the index of the third edition (Simon, 1976), published two years before Simon received the Nobel Prize in Economics, includes the subheading “Bounded Rationality” in three locations under the heading “Rationality.” This paper combines the writings contained in these three locations into three characteristics: (I) That is bounded by the constraints of individual rationality; (II) That makes it impossible to know all alternative behaviors and their consequences and maximize the given values as assumed in game theory; and (III) The organization provides that with a decision-making environment in which behavior that is rational from the standpoint of the given environment is also rational from the standpoint of the group. In the third edition, Simon essentially called that “bounded rationality” and drew a sharp distinction from game theory. However, the concept embodied in that is Barnard’s “restricted but important capacity of choice.”

Keywords: bounded rationality, game theory, organization theory, rational choice, Herbert A. Simon, restricted capacity of choice

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Introduction

Herbert A. Simon, the author of Administrative Behavior (Simon, 1947, 1957, 1976, 1997), was born on June 15, 1916 and died on February 9, 2001. In 1978, he received the Nobel Memorial Prize in Economic Sciences for his pioneering research into the decision-making process within economic organizations. Administrative Behavior is one of his key contributions and has four versions: the 1947 edition (1st edition); the 1957 edition (2nd edition); the 1976 edition (3rd edition), published two years before he received the Nobel Prize in Economics; and the 1997 edition (4th edition), published four years before his death. The fourth edition (Simon, 1997) calls a “tripartite organization” in referring to the third edition (Simon, 1976) with labels of “lengthy introduction,” “original text,” and “reprints of recent articles” (Simon, 1997, p. viii). Using this “tripartite organization,” we establish the relationship among the editions (Table 1).

Table 1. Structural transitions from the first to the fourth editions

|                     | 1st ed. (1947) | 2nd ed. (1957) | 3rd ed. (1976) | 4th ed. (1997) |
|---------------------|----------------|----------------|----------------|----------------|
| Lengthy introduction| —              | 31 pages       | 34 pages       | 4 pages        |
| Original text       | Chaps. 1–11    | Chaps. 1–11    | Part I (Chaps. 1–11) | Chaps. 1–11* |
| Reprints of articles| —              | —              | Part II (Chaps. 12–17) | —              |

*Note*: The fourth edition (Simon, 1997) is structured such that the lengthy introduction and Part II of the third edition (Simon, 1976) are reorganized as “Commentary on Chapter n” following Chapters 1–11 of the “original text.”
Where is bounded rationality from?

The book size of the fourth edition is much larger and uses a different type of paper. With the exception of some minor portions, the first edition through the third edition include the exact same content as that in the original text with identical page numbers on each page. However, even with the successive publishing of the three editions, the books have a cumulative increase of illegible print.¹ In fact, the third edition maintains even the printing irregularities of the second edition to the extent that the third edition seems like an exact replica of the second. In reality, the second edition itself may be an exact replica of the first edition.²

¹ An exception is page 59, on which the prints of first and second editions are illegible; however, this was remedied in the third edition.
² There are numerous locations on the far right of pages in the second and third editions, in which periods and hyphens (of course, these were also present in the first edition) were not printed. For example, in the second edition, a period and comma are missing in two lines on page 253 [the eighth and ninth lines from the bottom]; a period on page 41 [the ninth line] and hyphens on various lines on page 91 [the second and third lines from the bottom] are missing from the third edition. Among these, the missing period on page 41, which despite being located three quarters away from the beginning of the line [page 47, the second line], is perpetuated in the fourth edition as well—the edition which had corrected certain errors from the previous editions. The fourth edition may have been created by scanning the original data from the third edition. Why, then, was the third edition replicated using the second edition as a model and not the initial edition? The reason lies in the corrections that were made, though only a small portion, from the first to the second editions. The first and second editions are exactly the same up until the index, with two exceptions that the present author has been able to detect. (1) [page 244, seventh line] The phrase in the first edition reads “Since the administrative theory is....” However, in the second edition, the definite article (the) is eliminated: “Since administrative theory is.....” (2) [page 250, the tenth line from the bottom] The first edition reads “predicated on ought-sentences,” while the second edition replaces “on” with “of”: “predicated of ought-sentences.” The indicated modifications reorganize the entire paragraph and are relatively easy to detect; however, this is not applicable to all such instances in the text.
Bounded Rationality Does Not Exist in the Original Text

Although bounded rationality has become such a widespread concept that even the mere mention of the name “Simon” calls the phrase to mind, this particular phrase does not appear even once in the original text of *Administrative Behavior*. However, it does appear for the first time in the Introduction\(^3\) of the third edition in two locations, on pages xxxi and xxxiii. In spite of this, the index of the third edition includes the subheading “bounded rationality” under the heading “rationality” (Simon, 1976, p. 363). In addition to the Introduction, the following three locations from the original text are cited as sections that have the exact same wording as those in the first and second editions (equivalent to Part I in the 3rd edition).

(I) “The diagnosis of administrative situation” segment in the “An approach to administrative theory” section of Chapter 2 (Simon, 1976, pp. 38–41).

(II) The first three paragraphs in the “The limits of rationality” section in Chapter 5 (Simon, 1976, pp. 80–81).

(III) The “Lessons for administrative theory” section in Chapter 11 (Simon, 1976, pp. 240–244).

The term “bounded rationality” neither exists in these segments nor does it appear under the heading “rationality” (Simon, 1947, p. 258, 1957, p. 258) in the index of the first and second editions. Furthermore, it appears that the segments (I), (II), and (III) on pages 45–47, 93–92, and 322–325, respectively, have been omitted from the indexed locations for “bounded rationality” in the index of the fourth edition. Even in the fourth edition, sections (I), (II), and (III) have the

\(^3\) It also appears in the commentary section in the fourth edition. The Introduction in the third edition is reorganized and reused in each chapter’s commentary section in the fourth edition.
same wording, which clearly does not include the term “bounded rationality.” Hence, its omission is of no surprise. In sum, the term “bounded rationality” does not appear at all in the “original text” of Administrative Behavior from the first to the fourth editions.

**Rationality in Administrative Behavior**

At this juncture, a closer examination of the indexed content in Administrative Behavior under “bounded rationality” is in order. As previously noted, with the exception of some minor portions, the first edition through the third edition have the exact same content and page numbering as those in the “original text.” Hence, only the page numbers are referenced except for the Introduction.

(I) Chapter 2: Some problems of administrative theory

In the latter section of Chapter 2 entitled “An approach to Administrative Theory” (pp. 36–44), Simon provides an acute discussion of rationality and limits, and emphasizes a “scientific” approach to management theory to counter traditional administrative principles. In other words, when considering a single member of the administrative organization, to the extent that the

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4 Not only is the wording the same but also the printing errors, such as missing periods on page 41 [the ninth line] indicated in footnote 2, are perpetuated in the fourth edition (Simon, 1997, p. 47, the second line). However, there are certain differences, such as the correction of a question mark in the third edition (Simon, 1976, p. 41, the fourth line) to a period in the fourth edition (Simon, 1997, p. 46, the third line from the bottom). Also, the “Co.” and “& Co.” in the names of the publishers “D. Appleton-Century Co.” and “Henry Holt & Co.” were deleted in the fourth edition (Simon, 1997, p. 93, footnote 1, second and sixth lines from the bottom).

5 In the fourth edition, only the commentary sections are included in the index.

6 Chapter 2 is made up of two sections, and the first section “Some accepted administrative principles” (Simon, 1997, pp. 20–36) sharply and repeatedly criticizes administrative principles for the theme of Chapter 2.
limits to the quantity and quality of his output are removed, the organization approaches its goal of high efficiency. “Hence, administrative theory must be interested in the factors that will determine with what skills, values, and knowledge the organization member undertakes his work (p. 39).” These—skills, values, and knowledge—are the “limits” to rationality which must be dealt with by administrative principles (pp. 39–40).

In this manner, the limits on an individual’s ability that determine the efficiency of an administrative organization are described as a “triangle of limits” comprising the three sides: skills, values, and knowledge. However, if other limits or sides are added, it may no longer be referred to as a triangle; for example, in case of four or five limits, the shapes change to a square or pentagon. Hence, Simon states, “this triangle of limits does not completely bound the area of rationality, but it is variable.”
Therefore, this is actually part (I) (pp. 38–41). Thus, logically thinking, Simon found “bounded rationality” in an individual who is bounded by his triangle of limits or limits to rationality.

However, Simon considered eliminating the limits on individual ability to achieve higher efficiency in the administrative organization. This embodies the idea of maximization problem within constraints; the maximum value of the objective function would be higher if the constraints were relaxed. This point is clarified in Chapter 11.

(II) Chapter 5: The psychology of administrative decisions

Chapter 5 attempts to understand, from a psychological perspective, what goes on in a person’s mind when making decisions. Chapter 4 touches on the objective environment for decision-making (p. 61) and defines “objective rationality” (p. 80). This becomes a precursor to (III). In the first segment, “Behavior Alternatives” of the section entitled “Alternatives and Consequences” in Chapter 4, a decision-making model is presented by using game theoretic concepts. Namely, “The task of decision involves three steps: (1) the listing of all the alternative strategies; (2) the determination of all the consequences that follow upon each of these strategies; (3) the comparative evaluation of these sets of consequences” (p. 67).

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7 As mentioned later, this topic probably derives its origin from Barnard’s “psychological factors.” However, caution is required as the summaries at the beginning and end of Chapter 5 do not include the matters discussed in the chapter as a whole. In fact, most of Chapter 5 is a description of the concept that Simon later refers to as a “program.” At that time, stored programs on electronic digital computers had not yet become public and because the concept of a program did not exist, Simon undertakes a description of the so-called “program” with much difficulty; however, most of this portion in Chapter 5 can be simplified by using the concept of a program, as Simon subsequently does himself.

8 Footnote 4 (Simon, 1976, p. 67) further clarifies, “The theory presented here was worked out by the author in 1941. Its present reformulation has been greatly influenced by the remarkable work of John von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior* (Princeton: Princeton University Press 1944, chap. 2).”
The last section, “Definition of Rationality” (pp. 75–77), that is, before the conclusion in Chapter 4, Simon states, “Roughly speaking, rationality is concerned with the selection of preferred behavior alternatives in terms of some system of values, whereby the consequences of behavior can be evaluated” (p. 75). Furthermore, to clarify what objectives and whose values, he recommends the use of the term “rational” in conjunction with appropriate adverbs (p. 76). In the last paragraph of this section, he first defines objectively rational as follows: a decision is called objectively rational “if in fact it is correct behavior for maximizing given values in a given situation” (1976, p. 76). In other words, Simon refers to objective rationality as (A) for a given situation, (B) (1) by knowing alternative behaviors and (2) all consequences to maximize (3) given values. Following this definition, Simon develops his argument in Chapter 5.10

Denying objective rationality (B) implies bounded rationality

In Chapter 5, Simon reconfirms the definitions (1), (2), and (3) of (B) of objective rationality as mentioned above ((a), (b), (c) in p. 80), and states that actual behavior falls short of objective rationality at least with regard to the following three points: (1) only two or three of all possible alternative behaviors ever come to mind, (2) knowledge of their consequences is always fragmentary, (3) values can only be imperfectly anticipated for future consequences (p. 81). This part on pages 80–81 is (II). If we seek to understand this as intended, we can assume that Simon comprehended “bounded rationality” as that which is unfulfilled by the objective rationality of game theory.

9 Judging from its appearance two pages prior to this quote in the segment entitled “The system of values—utility surface” (Simon, 1976, p. 73), the “system of values” is considered to be a “utility surface” or a utility curve.

10 It continues with the following enumeration: “subjectively” rational, “consciously” rational, “deliberately” rational, and “organizationally” rational (Simon, 1976, pp. 76–77).
The development of the rest (A)

The remaining (A) “for a given situation” is further expanded upon in Chapter 7 and thereafter. At the beginning (the first paragraph) of Chapter 5, Simon notes in advance that the behavior of a single and isolated individual cannot reach a high degree of rationality and it is difficult to consider an even approximation of objective rationality. Individual choice is made in an environment of “given” and “behavior is adaptive only within the limits set by these ‘givens’” (p. 79).

In the final section “Summary” at the end of Chapter 5, Simon says that human rationality operates within the limits of a psychological environment, and “this environment imposes on the individual as ‘givens’ a selection of factors upon which he must base his decisions” (p. 108).

Since “the stimuli of decision can themselves be controlled so as to serve broader ends” (pp. 108–109), Simon’s idea develops into the possibility of integrating a set of individual decisions into a well-conceived plan. It is important for an organization to influence an individual’s environment upon which he or she must base his or her decisions. As he notes in advance in the last paragraph of Chapter 4, the analytical tools developed in Chapters 4 and 5 are used to analyze authority (Chapter 7), communication (Chapter 8), criteria of efficiency (Chapter 9), and loyalty and unity (Chapter 10).11

11 Chapter 6 “The Equilibrium of the Organization” differs from Chapters 7–10 in nature. The fact that the equilibrium of the organization is Barnard’s (1938) idea is clarified in footnote 1 in Chapter 6 (Simon, 1976, p. 111). However, in contrast to Barnard’s treatment of the concept of efficiency, Simon treated the concept as a sharp tool designed to carve out rationality (in Chapters 2–4). Thus, the concept of the equilibrium of the organization was selectively pruned from Barnard’s concept of efficiency. Hence, it was necessary to isolate and revive the equilibrium of the organization here. In the last section “Organization equilibrium and efficiency” (Simon, 1976, pp. 118–122) of Chapter 6, Simon reconfirmed his thinking regarding efficiency using the definition of “the criterion of efficiency.” It is also noteworthy that the chapter on “The Equilibrium of the Organization” did not exist in the preliminary edition of 1945.
This was the layout of his book.

(III) Chapter 11: The anatomy of an organization

(III) is “Lessons for Administrative Theory,” Chapter 11 (pp. 240–244). The first half (pp. 240–242) is a review of Chapter 2 and rehashes the same discussion of the “triangle of limits” from (I), with concrete illustrations of methods to enlarge the area of rationality regarding the three types of limits on individuals’ skills, values, and knowledge.

In contrast, the latter half (pp. 241–244) discusses the opposite approach: It is the basic task of administration to provide each operative employee with an environment of decision, in which behavior that is rational from the standpoint of this environment is also rational from the standpoint of the group12 (p. 243). This idea is also tied with the construction of organizational theory in Chapters 7–10 that analyze the establishment of the individual’s environment of decision.

In this manner, the two approaches indicated in (III) of Chapter 11 are mutually complementary for the administrative organization to achieve higher efficiency: “Since administrative theory is concerned with control of the nonrational, it follows that, the larger the area of rationality, the less important is the administrative organization” (p. 244).

Hence, we combine the writing contained in these three locations, which are noted as “bounded rationality” in the index, into three characteristics as follows:

(I) That is bounded by the constraints of individual rationality.

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12 As shown here, a decision from the standpoint of the group is “objectively rational” and a decision from the standpoint of the deciding individual is “subjectively rational” (p. 243). However, the definition of “objectively rational” differs from the concept of objective rationality of game theory (Chapter 4), and this may cause some confusion.
(II) *That* makes it impossible to know all alternative behaviors and consequences and maximize given values as assumed in game theory.

(III) The organization provides *that* with an environment of decision, in which behavior that is rational from the standpoint of this environment is also rational from the standpoint of the group.

**Enter “Bounded Rationality”**

In (I), (II), and (III) in the third edition, Simon essentially referred to “bounded rationality” as *that* to draw a sharp distinction to game theory. The following is quoted from a paragraph in “Introduction to the second edition” (Simon, 1957, pp. xxviii–xxix):

The theory of rational choice in *Administrative Behavior* incorporates item (1) of this list, but not items (2) through (5), which characterize economic man rather than administrative man. This vital distinction has been overlooked by even as perceptive and sympathetic a critic Andreas Papandreou, who has said of *Administrative Behavior* that it “brought together under one conceptual roof Barnard’s concept of organization and von Neumann and Morgenstern’s concept of a game of strategy (footnote 8).

The preceding quote was rewritten extensively as the following paragraph found in “Introduction to the third edition” (Simon, 1976, p. xxxiii) (footnote 8 was omitted in the third edition):

The theory of bounded rationality in *Administrative Behavior* incorporates item (1) of this list and is not incompatible with item (3), but the remaining items characterize economic man rather than administrative man and are not part of the model used here. This vital distinction has sometimes been overlooked by
commentators, who have mistakenly supposed that the term “rational” in *Administrative Behavior* has essentially the same meaning as it has for classical economists, game theorists, and statistical decision theorists.

The term “bounded rationality” appears in the opening sentence of the revised paragraph; however, Simon’s list of (1)–(5) is compiled from concepts built into *Theory of Games* by von Neumann and Morgenstern (1944), which appears before these paragraphs. Although item (3) is somewhat different as listed in Table 2, essentially, Simon insists on that among these five items, his own theory derives only the “tree” concept from *Theory of Games* by von Neumann and Morgenstern (1944). Actually, due to the positioning in (II), it is more accurate to label “bounded rationality” as a subspecies of game theoretic rationality, as we have seen. However,

| Concepts built into *Theory of Games* of von Neumann and Morgenstern (1944) | Theory of rational choice (2nd ed.) | Theory of bounded rationality (3rd ed.) |
| --- | --- | --- |
| (1) representing possible future behavior as a tree | Yes | Yes |
| (2) taking the minimax* | No | No |
| (3) using a mixed strategy | No | Incompatible |
| (4) forming coalitions | No | No |
| (5) choosing so as to maximize the expected value of cardinal utility | No | No |

*Note*: The “minimax” here indicates one of the decision principles (Takahashi, 2012).
“Introduction to the third edition” emphasizes something that is different from the “rationality” of classic economics, game theory, and statistical decision theory, and referred to this something as “bounded rationality.”

The following had been written in footnote 8 of “Introduction to the second edition,” which was omitted from “Introduction to the third edition”: “The preliminary version of Administrative Behavior was completed before the Theory of Games appeared” (Simon, 1957, p. xxix). The copyright page in the first edition (Simon, 1947) of Administrative Behavior includes the notation “COPYRIGHT, 1945, 1947, BY HERBERT A. SIMON.” According to Simon’s autobiography (Simon, 1991, Chapter 6), when he was an Assistant Professor at the Illinois Institute of Technology, he revised his doctoral thesis, which had been submitted to the University of Chicago, and distributed it to various institutions to receive comments while searching for a publisher. Indeed, this distributed version is the 1945 preliminary edition, and it was in fact an edition that he himself distributed, rather than published. Simon was conscious of the publication year of von Neumann and Morgenstern’s (1944) Theory of Games and wanted to assert his own originality to the extent that he inserted the preliminary edition year of 1945 in the copyright page credits.

13 The expression “preliminary edition” itself appears in the first sentence of the second paragraph in the Preface of the first edition; but it is not explicit that it is referring to the 1945 edition. However, the ninth printing of the first edition (1955), currently possessed by the author, includes this comment at the bottom of the back flap of the book jacket: “NOTE: A preliminary edition of this book was issued in 1945 by the author for limited distribution.”

14 In 2006, Takashi Shimizu (University of Tokyo) located a copy of the preliminary edition in the Yale University library, but it was merely a bounded typewritten copy of a rough draft.
Barnard’s Restricted Capacity of Choice

Thus, the above comment from Papandreou in “Introduction to the second edition” is reasonable.\textsuperscript{15} Without question, *Administrative Behavior* “brought together under one conceptual roof Barnard’s concept of organization and von Neumann and Morgenstern’s concept of a game of strategy.” Perhaps Simon planned to distinguish his work from Barnard’s with the introduction of the latest concepts of game theory for that time in Chapters 4 and 5 (see footnote 8 in this paper); the portion that he referred to as “the core of the book” (Simon, 1957, p. xi, 1976, p. xi).

Furthermore, in 1976, Simon wanted at the very least to ensure that the concept of “bounded rationality” was known to have been treated in “original text” of his *Administrative Behavior*. Perhaps the rationality touched upon in items (I), (II), and (III) might become “bounded rationality” when the differences with game theory are emphasized. However, replacing “*that*” in items (I), (II), and (III) with the term “bounded rationality” can only be done with considerable discomfort, because the context does not originally deal with rationality.

Barnard, who wrote the “Foreword” to *Administrative Behavior*, believed that the individual has “the restricted but important capacity of choice” (Barnard, 1938, p. 38). As indicated by Takahashi (2007, Appendix), because the “power of choice” is limited, “limitation of possibilities is necessary to choice” and the decision processes are

\textsuperscript{15} For example, one must consider that the arguments in Chapter 5 “The psychology of administrative decisions” probably derives its origin from Barnard’s “psychological factors.” What Barnard referred to as “psychological factors” are substituted within Simon’s with “a psychological environment,” “an environment of given,” and “a given situation,” and later referred to as “definition of the situation” by March and Simon (1958).
“largely techniques for narrowing choice” (Barnard, 1938, p. 14). Namely, the “that” in (I), (II), and (III) fits perfectly into Barnard’s “restricted but important capacity of choice.” If Simon simply called that “restricted but important capacity of choice” to follow Barnard in a good grace, then he could extend the influence of Administrative Behavior on much of today’s research related to capability (Clark & Fujimoto, 1991; Cusumano & Selby, 1995; Eisenhardt & Tabrizi, 1995; Iansiti, 1998; Kuwashima, 2003; Tomita, 2009).

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References

Barnard, C. I. (1938). The functions of the executive. Cambridge, MA: Harvard University Press.
Clark, K. B., & Fujimoto, T. (1991). Product development performance: Strategy, organization, and management in the world auto industry. Boston, MA: Harvard Business School Press.
Cusumano, M. A., & Selby, R. W. (1995). Microsoft secrets. New York, NY: Free Press.
Eisenhardt, K. M., & Tabrizi, B. N. (1995). Accelerating adaptive process: Product innovation in the global computer industry. Administrative Science Quarterly, 40, 84–110.
Iansiti, M. (1998). Technology integration. Boston, MA: Harvard Business School Press.
Kuwashima, K. (2003). Organizational capability and competitive advantage in pharmaceutical product development. Annals of Business Administrative Science, 2, 21–27. doi: 10.7880/abas.2.21
March, J. G., & Simon, H. A. (1958). *Organizations*. New York, NY: John Wiley & Sons.

Simon, H. A. (1947). *Administrative behavior: A study of decision-making processes in administrative organization* (1st ed.). New York, NY: Macmillan.

Simon, H. A. (1957). *Administrative behavior: A study of decision-making processes in administrative organization* (2nd ed.). New York, NY: Macmillan.

Simon, H. A. (1976). *Administrative behavior: A study of decision-making processes in administrative organization* (3rd ed.). New York, NY: Free Press.

Simon, H. A. (1991). *Models of my life*. New York, NY: Basic Books.

Simon, H. A. (1997). *Administrative behavior: A study of decision-making processes in administrative organization* (4th ed.). New York, NY: Free Press.

Takahashi, N. (2007). *Koa tekiyuto: Keieigaku nyumon* [Introduction to management (core textbook)]. Tokyo, Japan: Shinseisha (in Japanese).

Takahashi, N. (2008). Gentei sareta gourisei wa dokoni [Where is “bounded rationality”?: Technical notes on Simon (1947, 1957, 1976, 1997)]. *Akamon Management Review*, 7(9), 687–706 (in Japanese).

Takahashi, N. (2012). On the future parameter. *Annals of Business Administrative Science*, 12, 277–290. doi: 10.7880/abas.12.277

Tomita, J. (2009). New product development and evaluating capabilities: The case of the material industry. *Annals of Business Administrative Science*, 8, 43–54. doi: 10.7880/abas.8.43

von Neumann, J., & Morgenstern, O. (1944). *Theory of games and economic behavior*. Princeton, NJ: Princeton University Press.

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