The Radical Constructivist Movement and Its Network Formations
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> Context • The main problem is the rather marginal status of radical constructivism within its core domains of brain research, cognition and learning. > Problem • The basic goal is to provide a short history of radical constructivism and its institutionalization processes. Additionally, the article specifies critical conditions that should be met in order for radical constructivism to become a mainstream endeavor. > Method • The main methods used are those of comparative historical research. > Results • The main results lie in the specification of missing elements that have blocked radical constructivism becoming a mainstream endeavor. > Implications • The paper might serve as a common reference for necessary steps to be taken over the following years in order to move radical constructivism out of its current weak position. > Key words • Scientific institutionalization processes, network analysis, comparative history of science analysis, re-inventing radical constructivism, research programs, research traditions.

In Howard Gardner’s The Mind’s New Science (Gardner 1985), the key figures of radical constructivism (RC) are not even mentioned and in John Brockman’s Third Culture (Brockman 1995), none of the main representatives of RC found his way into the book except for Francisco J. Varela, who presented himself in strict independence from RC. Currently one does not see significant contributions from RC in the mainstream journals on brain design, cognition, e-learning or on organizations. Given these past and present performances it is highly unlikely from an inductive point of view that the currently rather marginal position of RC will change in the future. So one could finish the article right away by concluding that RC, past, present and future, did not and will not have any chance of being answered in a direct manner. Consequently what I will argue subsequently is not an attempt to define RC but to lay out what RC as a mainstream endeavor could mean and imply. Consequently what I will argue subsequently refers to three potential versions of RC as a mainstream endeavor, rather than to RC itself.

1 | To avoid misunderstandings please note this is not an attempt to define RC but to lay out what RC as a mainstream endeavor could mean and imply. Consequently what I will argue subsequently refers to three potential versions of RC as a mainstream endeavor.
class of observations, data and measurements (DT). In Figure 1, no arrows have been used in order to stress the duality of top-down and bottom-up flows. Theoretical concepts, generative mechanisms and transfer-modules are as much shaped by the DT segment as observations, methods and data are determined by the theoretical core, the MMM segment or the BM domain.

Research traditions can be described as a network of research programs and can be visualized as in Figure 2.

Here one can see networks of theoretical cores (TC), of methods, mechanisms and models (M), of bridge modules (BM) on the one hand, and a rich network of different classes of observations, methods and data (DT) and a network of wider application domains (D) on the other hand. The application area changes into larger application domains D₁ to Dₙ where each domain captures a set of paradigmatic examples. RC, due to its large set of application domains and to its heterogeneous composition of theories, generative mechanisms or models, can best be characterized as a trans-disciplinary research tradition. The application domains Dᵢ cover unusually wide areas, ranging from cell biology to organizations and societal evolution. Thus, RC can be conceptualized as a research tradition that consists of a network of research programs.

From an organizational perspective, the concept of a radical constructivist network or RC network stands for a group of visionary scientists who developed the cognitive building blocks for RC from the 1960s onwards. The RC network during its formative years in the 1960s and 1970s includes, in alphabetical order, W. Ross Ashby, Stafford Beer, Heinz von Foerster, Ranulph Glanville, Ernst von Glasersfeld, Humberto R. Maturana, Gordon Pask, Ricardo Uribe and Francisco J. Varela. In the 1980s and 1990s, Dirk Baecker, Peter Hejl, Niklas Luhmann, Gerhard Roth, Siegfried J. Schmidt, Paul Watzlawick and others made significant additions and contributed, thus, to an expansion of significant parts of the RC network.

Second-order cybernetics will be used throughout this article as a special research program within the radical constructivist research tradition. Second-order cybernetics was promoted especially by von Foerster from the early 1970s onwards and constitutes, thus, an important component within RC as a research tradition.

Likewise, autopoiesis stands for a special research program within the radical constructivist umbrella. Autopoiesis was created by Maturana in collaboration with Varela and Uribe from the 1970s onwards and therefore forms, thus, another significant element within the radical constructivist research tradition.

Finally, institutionalization processes comprise a variety of cognitive and organizational features that describe the transformation of an initial research program, developed by a single person or by a group of scientists, into a mature research program or research tradition with a long-lasting organizational substructure. Following Peter Weingart (1974: 26f), institutionalization processes are characterized by the following set of attributes, namely identification, communication, initiation and boundary building, recruitment, diffusion and sanctioning. Using a slightly more systemic version, the process of institutionalization of research programs or research traditions comprises three clusters of dimensions.

4 | On the importance of visionary leaders, see, e.g., Hollingsworth & Hollingsworth (2000).

5 | The same description can be provided, in principle, for Pask and his conversation theory or for Beer's management cybernetics. Both research programs can be considered as network components of the radical constructivist research tradition.
The first cluster is cognitive in nature and is related to the cognitive dimensions in the institutionalization process of research programs or research traditions. The relevant network dimensions include identification, i.e., the availability of a distinguishable research program or a research tradition, demarcation, i.e., the boundaries of a research program or a research tradition, cognitive production, i.e., the proliferation of new scientific output within the network, cognitive complexity or cognitive evolution, i.e., the changes in research programs or research traditions over time.

For the institutionalization processes of a network that promotes a research program or a research tradition the following network dimensions become relevant, namely: initiation, viz., the initial stages in the institutionalization processes such as the organization of conferences and workshops, the founding of a journal, cross-citations of a group or a scientific school, etc.; communication processes within the network and with its environment; network institutionalization such as the creation of organizational units in the form of university or research institutes; voice and exit-processes within the network; network recruitment; sanctioning or organizational complexity.

The third cluster of dimensions is macro-dynamic in nature and is related to the evolution of a research network within its wider scientific and societal environment and its overall impact on the scientific landscapes altogether. The third cluster consists of dimensions such as self-organization, self-organized criticality, non-linearity, critical thresholds, regional variations, sensitivity to initial conditions, substitutability, impact and influence dimensions, etc.

This short section on terminology should help to provide precise and relatively short answers to the two guiding questions for this article. Turning to the first central question of this article, the answers must be given differently for three consecutive stages in the evolution of RC, namely for its initial period in the 1960s and 1970s, for the period from the early 1980s to the 1990s and for the last decade from 2000 to 2010.

2. The striking asymmetry between high cognitive production and low network formation during the 1960s and 1970s

For the formative years of RC during the 1960s and 1970s, one can observe a striking asymmetry between the cognitive dimensions of the radical constructivist network and the two other clusters of network dimensions. In this period one can see, on the one hand, an astonishing proliferation of new perspectives, highly innovative theoretical contributions and a massive accumulation of research reports, articles and books that embodied these new ways of world-making, and a very weakly developed network configuration, on the other hand.

Von Foerster’s second-order cybernetics was advanced in a number of articles throughout the late 1960s and 1970s. These articles (e.g., Foerster 2003) addressed the central problems of a new science of living systems by living systems and the logical and theoretical repercussions of this self-referential configuration.6

Likewise, the autopoietic program evolved in an impressive number of books and articles.7 Moreover, the autopoietic program contained a new type of logic, models of autopoietic evolution

6 | For more details, see Foerster & Müller (2003) or Müller (2008).
and a promising variety of new research designs.

- Von Glasersfeld was involved in three major research projects, namely in chimpanzee communication and the construction of Yerkish language, the formation of numerical concepts in children and, finally, concept formation in physics education, where he produced a number of widely recognized contributions.

- Between 1975 and 1976, Pask produced three volumes (Pask 1975a, 1975b, 1976) that highlighted the rich potential of conversation analysis and that laid the foundation for a potential revolution in learning and teaching environments.

- Beer developed an intriguing new perspective on management cybernetics that culminated in a large number of books (Beer 1972, 1973, 1974, 1979). Beer effectively brought a brain-based perspective to the study of organizations and developed a highly complex conceptual and formal framework for organizational analysis.

- Despite its cognitive richness in content, the organizational network features of RC failed nearly perfectly in all of the relevant networks dimensions of institutionalization processes and exerted a modest impact at best within the larger scientific environment. The name RC appeared for the first time in 1974 when von Glasersfeld wrote an article about Jean Piaget and the radical constructivist epistemology (Glasersfeld 1974). Prior to 1980, RC as a network of research programs was practically non-existent. Instead, one can observe an extremely loosely connected network of a small number of scientists across different domains with overlapping research interests and some cognitive commonalities between them. Even more importantly, none of the relevant actors involved in this personal network had the necessary means to promote network formations for his own domain, let alone for the radical constructivist network of research programs.

- Von Foerster left the University of Illinois in 1976 and lived during his entire retirement period in Pescadero, California. He was never in a position to assemble a number of co-workers around him to work on second-order cybernetics in a normal research environment.

- Maturana, Uribe, and Varela stopped their collaborative efforts in the 1980s and moved into three different academic cultures. Varela continued his academic work largely outside the umbrella of RC in Paris, Maturana moved more and more towards more general theoretical and philosophical issues and did not return to laboratory work and Uribe lived in a rather isolated manner at the University of Illinois.

- Von Glasersfeld was not in position to assemble a larger research group around him and was mainly part of larger research environments.

- Pask, despite a three volume set on conversation theory, failed to create a sufficiently strong research environment to promote conversation theory. In fact, a close analysis of Pask’s activities reveals that his activities in project acquisitions or publications declined significantly after the publication of the three volumes on conversation in the years 1975 and 1976, as can be seen in Figure 3.

- Beer, after his intensive involvement in the re-organization of the Chilean economy under Salvador Allende, practically stopped his large-scale organizational activities and confined himself to teamwork with small groups only.

Turning to the third cluster of developmental and impact dimensions within the larger scientific environment, the overall effects of the theoretically very rich but weakly developed radical constructivist network were moderate to weak only:

- It is interesting to note that the publications of radical constructivists during the formative period occurred very seldom in mainstream journals or with mainstream publishers. Most notably, von Foerster, despite his extremely interesting and path-breaking work on second-order cybernetics, never published an overview or a summary in one of the prestigious publication channels, but restricted himself to a collection of articles with a rather obscure publisher who was to go bankrupt soon after Foerster’s publication (Foerster 1982).9

8] These three paradigmatic examples have been extracted from Glasersfeld (1997a), which presents a short autobiographical sketch.

9] Another highly interesting book, Cybernetics of Cybernetics (Foerster 1974), was produced locally with very limited distribution capacities only.
Additionally, neither the representatives of RC nor someone else from outside acted as a vital network organizer. The network was restricted to personal contacts and exchanges and lacked practically all the ingredients of network promotions. Phrased differently, during these formative years the representatives of RC did not perceive themselves as adhering to a common research tradition that was to be propagated.

Finally, RC, during its formative period, failed to enter into prolonged debates with mainstream groups in the domains of brain design, cognition, learning, living systems and organizations. Thus, the impact dimensions of RC were relatively low and were confined mostly to presentations and discussions in mainstream conferences and seminars.

Consequently, for the period prior to 1980, the answer to the first of the two guiding questions can be given in a straightforward manner. In these formative years, RC lacked practically all organizational network features that could have promoted it to a mainstream endeavour, despite a massive production of radical breakthroughs and an astonishing accumulation of cognitive advances in several of its research programs under the flag of second-order cybernetics, autopoiesis, conversation theory or management cybernetics. With respect to the different research programs independently, none of them, for very different reasons, possessed the necessary resources and connections to establish themselves as a mainstream endeavour. As a consequence, RC, due to its weak network organization in its formative period, was not even considered as an important pioneering element. Due to the asymmetry between strong theory proliferation and weak network organization, RC did not become a mainstream part of the history of the cognitive neurosciences or of the big wave of complexity sciences.

3. Failing to become a mainstream research tradition during the 1980s and 1990s

The subsequent part of the answer to the first of the guiding question is focused on the years in the 1980s and the 1990s. For this period one can observe that RC was successful in organizational network dimensions, but operated with a bundle of important restrictions and constraints that, in conjunction, contributed to the overall failure of its becoming a mainstream endeavour. At this point it is necessary to look at the apparently successful diffusion of RC in the 1980s and the 1990s in closer detail.

In 1981 Watzlawick edited a German volume under the title *Die erfundene Wirklichkeit* [The Invented Reality] with the subtitle “Contributions to Constructivism.” Here, von Glasersfeld and von Foerster are presented at the beginning with “Introduktion to RC” and “Constructing a Reality,” respectively. Von Glasersfeld’s “Introduction to RC,” especially, proved to be a highly influential article for the promotion and the diffusion of RC. For the first time, RC was presented as a homogeneous research tradition and as an umbrella term for the research programs by von Foerster, Maturana, Francisco Varela and significant others.

However, in Watzlawick’s book one finds contributions by Jon Elster and by Rupert Riedl, too, who would have been very much opposed to being classified as radical constructivists. Thus, Watzlawick’s book was not the tipping point in the subsequent diffusion of RC, but its starting point. It is exceedingly difficult to determine a single event or occurrence as crucial or decisive for the diffusion of the group label RC. Rather, RC was invented in the German-speaking world in the course of the 1980s through a homogeneous flow of events, through self-propagations, especially by von Glasersfeld, and through publications, lectures, workshops, conferences or media reports, which were very much supported by the fact that the new group members of RC had been linked through a personal network in the previous period. An important step in the diffusion of RC was, for instance, the publication of three volumes with articles by Maturana (1985), von Foerster (1985) and von Glaserfeld (1987). These three books were published in German under the guidance of Schmidt, who became a powerful network organizer for RC during these years. In 1987 Schmidt himself edited a book under the title *The Discourse of RC* (Schmidt 1987), which comprised Maturana, Varela, von Foerster, and von Glaserfeld as well as a group of German authors who concentrated their work on special aspects of RC. Equally important, the 1987 volume contains a long introductory article by Schmidt on RC as a new paradigm for interdisciplinary discourse. In this overview, RC appears as a coherent research tradition that was jointly generated by the works of Maturana and Varela in the domain of biology or by von Foerster and von Glaserfeld in the area of cognition and philosophy.

Adding to the stream of events, Luhmann published his *Social Systems* (Luhmann 1984) in the same year, which saw very frequent references to von Foerster, Maturana and Francisco Varela and which increased interest in these three authors from the sociological or the wider social science community. By the early 1990s RC had gradually emerged in the German-speaking parts of the world as a common label that von Glaserfeld persistently used as a self-description and that was also used as a description by others for a seemingly homogeneous research tradition.

was being fabricated, under the title *How We Invent Ourselves* (Foerster & Glaserfeld, 1999).

11 | It is interesting to note that in the bibliography of Siegfried J. Schmidt’s overview of radical constructivism, he cites most frequently a group of German authors, i.e., Hejl (6 times), Roth (6) and Schmidt (9), followed by radical constructivists such as von Foerster (2), Ernst von Glaserfeld (4), Maturana (2) and Varela (3). Equally interesting is Piaget is cited only once and Ashby, Beer and Pask are not to be found in the bibliography.

12 | See, however, von Foerster (2001: 241), who expressed his strong mental reservations against the term “radical constructivism” by saying: “I don’t want to be associated with constructivism. I have no idea what constructivism means” (my translation). Likewise, Maturana and
Despite this impressive take-off of RC, five important restrictions must be emphasized that limited the expansion of the radical constructivist network.

1. These network formations were confined to a single region, namely to the German-speaking world. The radical constructivist network was considerably weaker in countries such as Italy, France or the UK and continued to be extremely weak within its country of origin, namely the United States.

2. The cognitive diffusion of RC during the 1980s and 1990s took place in areas outside the core areas of RC, namely in fields such as architectural design, sociology, the literary sciences, the media sciences or systemic family therapy. This point is of considerable importance because these new areas were largely constructed by transferring concepts or perspectives from the RC core domains to fields such as the media sciences or systemic family therapy. In cognitive terms, RC has ceased to be a research tradition with progressive problem shifts (in the sense of Imre Lakatos) in its core domain of brain design, cognition, learning, living systems, and organizations.

3. Probably most importantly, the rich cognitive production of the former period in the core areas stopped and was replaced, more and more, by publications in areas such as the history of philosophy, epistemology or in general philosophical domains such as ethics. Thus, the process of a regional homogenization of RC towards a research tradition of research programs was accompanied by a gradual drift towards the philosophical domain and by a successive marginalization of the different empirical research agendas. Both for the speakers of and for the listeners to RC, a gradual convergence occurred towards a new philosophical paradigm with post-modern undertones, directed against realism, against ontology or against truth and addressed to the observer and to the empowerment of the observers as world-generators or world-producers.

4. In an organizational network perspective, even the rapidly growing popularity of radical constructivism within the German speaking worlds was accompanied by weak network institutionalization processes. RC was located in a small number of places in Bielefeld, Siegen or Heidelberg only, but did not expand beyond a small number of locations in the German speaking world.

5. Highly important authors and groups in the formative phase of RC, such as Ashby, Beer or Pask, were no longer considered part of the radical constructivist core group and their family resemblances. Even Piaget, though the unquestioned hero in von Glaserfeld’s 1974 article, moved into the periphery of German-style RC.

All five constraints, in combination, prevented RC from becoming a mainstream endeavour at the global level in its core domains of brain design, cognition, learning, living systems, and organizations during the period of the 1980s and 1990s. Instead, one could observe an impressive but under-critical diffusion in limited areas of regional coverage and of scientific fields.

4. The very weakly developed status of radical constructivism in the last decade

For the last decade, the situation has worsened considerably. Due to the non-proliferation of new perspectives and research designs in the core domains one can observe a significant drop of interest in RC altogether. Most notably, Schmidt’s 2003 book, with the subtitle “Abschied vom Konstruktivismus [A Farewell to RC],” marked a turning point and the beginning of a downward drift in the diffusion of RC in the German-speaking world, too.

Turning, thus, to the third part of an answer to the historical core question of this article, the answer becomes disappointingly simple. RC in its contemporary format from 2000 up to the present suffered from a five-fold problem that effectively prevented it from becoming a mainstream endeavor.

- In cognitive terms, RC has ceased to be a research tradition with progressive problem shifts (in the sense of Imre Lakatos) in its core domain of brain design, cognition, learning, living systems, and organizations. In these areas, RC is confined to the rich legacy from the 1960s and the 1970s.

- Moreover, the cognitive productions of the radical constructivist network in the last decade have moved more and more to philosophical domains and the empirical research applications of RC have dropped significantly.

- In terms of network recruitment, the new members of RC have operated and continue to operate in areas outside the

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<td>Cognitive production</td>
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<td>Network organization</td>
<td>very weak</td>
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Table 1: The evolution of the radical constructivist network, 1960–2020.
core domains of RC. This point is so important because one cannot possibly expect significant contributions from these outside domains to RC as a research tradition in the domains of brain design, cognition, learning, living systems, and organizations.

- In terms of network diffusion, one could observe continuous efforts in the area of journal production, book publications, conferences and the like. But these activities have been much too weak in nature, very much confined in their impact to relatively small niches and by and large unattractive for the mainstream areas in the life sciences or the cognitive sciences.

- Finally, RC over the last ten years has not been involved in any serious activities in mainstream journals or in debates with mainstream groups in the core RC domains of brain design, cognition, learning, living systems and organizations.

Seen in an organizational network context, RC in recent years simply lacked almost all ingredients for sustainable institutionalization processes that could move it to a mainstream endeavor. Even worse, RC as a viable research tradition has moved itself to a position where it could rapidly become an obscure object of historical interest only.

5. Is there a future for radical constructivism aside from its past?

Towards the end of this article, it might be useful to summarize the discussion so far in a table that highlights the evolution of the RC network from the 1960s onwards and that uses a five-point scale with the values of very weak, weak, moderate, strong and very strong, where very strong refers to network organizations as a mainstream endeavor.

Thus, Table 1 re-iterates, once again, that throughout its entire history, RC has fallen significantly short, due to its persistently weak network organization, of becoming a mainstream endeavor.

However, turning to the final column in Table 1, one can observe some recent encouraging signs of a new wave of cognitive proliferations and at least of partial re-inventions of RC. Glanville's three book set on “The Black B∞x” (Glanville 2009–2011), Stuart A. Umpleby’s work on self-reflexivity (2010; Umpleby & Nedev 2009), Søren Brier’s perspectives on cybersemiotics (Brier 2008a, b), Louis Kauffman’s focus on self-reference and Eigen-Forms (Kauffman 2005, 2009), Bernhard Poerksen’s massive edition of key works of constructivism (Poerksen 2011), Alexander Riegler's ceaseless efforts to provide a broad discussion platform on RC within Constructivist Foundations or the author's three volume edition of a New Science of Cybernetics (Müller 2008, 2010 and 2011), the organization of bi-annual Heinz von Foerster Conferences in Vienna or Nagib Callios’ annual World Conferences on “Systems, Cybernetics and Informatics” point at least to the possibility of a U-turn of RC from its rather bleak current stage.

Following Table 1, it must be clear that RC, in order to become a mainstream endeavor in the future, needs nothing less than a complete re-invention of its rich cognitive tradition for the emerging science landscapes of the 21st century. Let us assume that the authors just mentioned in the preceding paragraph and the contents of their work give rise to a new wave of cognitive building blocks within the overall RC research tradition. Even under this optimistic assumption, RC from now on and for the near future would need to meet the following seven requirements in order to become a major element in the future unfoldings of the cognitive sciences, of the life sciences, of machine-assisted learning environments or of organizational studies.

1. The rich legacy from the formative period needs to be accommodated and adapted to the research environments of the 21st century. This task may sound trivial at first sight, but becomes highly challenging at second and third sight. What is needed here is a transformation of the old research programs and their accommodation and adaptation to current problems and discussions on the one hand and, even more importantly, to a concise presentation of the comparative advantages of these adapted and accommodated research programs for the present scientific landscapes.13

2. Probably the most important condition for re-inventing RC lies in a small number of active network nodes within the core domains of RC, namely in brain design, cognition, learning, living systems, and organizations. This vital condition asks for two to three new research groups that are not currently part of the RC network that promote a radical constructivist agenda in areas such as situated cognition or in ICT-learning environments and that add new insights and perspectives to the models, mechanisms and methods of RC as a research tradition.

3. Another condition for a future drift of RC towards a mainstream endeavour lies in the establishment of at least another network node outside the RC core domains, but more towards the centre of scientific landscapes in areas such as self-reflexive economic modelling or cognitive psychology.

4. One would need at least a small number of highly active research nodes within the radical constructivist network in its current application domains of media sciences, the social sciences, family therapy, architectural design or organizational learning.

5. The radical constructivist network would need at least a small number of persons or groups who could act as network promoters of RC and who can exert a significant push across the organizational dimensions of the RC network. Aside from the ongoing current efforts, one would need nothing less than a new wave of mainstream publications on a global scale, similar to the regional wave of publications for the German-speaking world during the 1980s and 1990s.

6. RC would need to be re-designed along the institutionalization dimensions of teaching and education as well, where the new wave of cognitive productions would have to be transformed into university curricula and into learning packages that would facilitate the implementation of RC courses, seminars within the RC core domains of brain design, cognition, learning, living systems, and organizations.

7. For a drift of RC towards a mainstream endeavor, one would need, finally, a small number of open problems and conflicting views, where RC could enter into a scientific debate with mainstream groups in the core RC domains of brain design, cognition, learning, living systems, and organizations.

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13 For an accommodation of von Foerster’s second-order cybernetics, see Müller (2007).

http://www.univie.ac.at/constructivism/journal/6/1/031.mueller
Conclusion

The general question, “Can RC become a mainstream endeavor?”, despite its generality, could be answered in the following short way: Under the past or present configurations of the radical constructivist network the answer is clearly negative; with respect to the future, the status of RC as a mainstream endeavor is possible but rather unlikely because the set of seven challenging requirements turns out to be, like the Popperian truth, “hard to come by”.

Nevertheless, questions involving our own future fall under, following Heinz von Foerster, the category of being un-decidable in principle. And it belongs to the charm of un-decidable questions that their answer has to be provided by ourselves, by our own future activities and only by our own future activities.

References


14] This list is meant to represent the additional requirements for the network organization of RC under the assumption that a wave of new RC content is currently being produced, rather than to focus on the cognitive content of RC that would make RC more interesting and attractive as such.


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