

Appendix A

See Tables A.1, A.2, A.3 and A.4.

Table A.1 Most relevant publications on Futures Studies: the 19th century

Title	Year
Hazlitt, W. (1805). An essay principles human action	1805
Le Bon, G. (1897). The crowd: A study popular mind. Fischer	1827
Mill, J.S. (1862). Principles Political Economy, 5th edn, Parker, Son, Bourn, London	1862
Von Clausewitz, C., and Graham, J. (1873). On war (Vol. 1). London: N. Trübner and Company	1873
Bagehot, W. (1881). Biographical Studies, Longmans Green, London	1881
Blondel, M. (1893). L'action, essai d'une critique de la vie et d'une science de la pratique	1893
Browning, R. (1896). Poetical works. Smith, Elder & Co.	1896
Dewey, J. (1896). Reflex arc concept psychology. Psychological Review, 3, 357370. doi:10.1037/ h0070405	1896
Follett, M. P. (1896). Speaker house representative. New York: Longmans Green	1896

Table A.2 Most relevant publications on Futures Studies: first half of the twentieth century

Title	Year
de Tarde, G. (1901). <i>L'opinion et la foule</i> . Paris, Alcan	1901
Gibbs, J. W. (1902). <i>Elementary principles in statistical mechanics: developed with special reference to the rational foundation of thermodynamics</i> . Dover Publications	1902
Gantt, H. L. (1903). <i>A Graphical Daily Balance Manufacture</i> . Transactions American Society Mechanical Engineers, Volume XXIV, 1322–1336	1903
de Tarde, G. (1903). <i>The Laws of Imitation</i> (Henry Holt, New York)	1903
Pareto, V. (1906). <i>Manuale di economia politica</i> (Vol. 13). Societa Editrice	1906
Taylor, F. W. (1911). <i>Principles scientific management</i> . New York: Harper & Brothers	1911
Brunschvicg (Lon), (1912), <i>Les tapes la philosophie des Mathmatiques</i> , Paris, Flix Alcan	1912
Fayol, H. (1916). <i>Administration industrielle et générale-Prévoyance. Organisation, Commandement, Coordination, Contrôle</i>	1916
Knight, F. H. (1921). <i>The meaning of risk and uncertainty</i> . F. Knight. Risk, Uncertainty, and Profit. Boston: Houghton Mifflin Co, 210–235	1921
Follett (Mary Parker), (1924), <i>Creative Experience</i> , Longman Green, New York	1924
Follett, M. P. (1925). <i>Power</i> . Public lecture reprinted (1995). In P. Graham (Ed.), <i>Mary Parker Follett, prophet management: A celebration writings from (1920)s</i> (pp. 97–119). Boston: Harvard Business School Press	1925
Lotka, A.J., (1925). <i>Elements Physical Biology</i> . Williams Wilkins, Baltimore	1925
Volterra, V. (1926). <i>Fluctuations abundance species considered mathematically</i> . Nature 118, 558–560	1926
Volterra, V. (1926). <i>Variazioni e fluttuazioni del numero d'individui specie animali conviventi</i> . Mem. R. Accad. Naz. Lincei 2, 31113	1926
Bachelard (Gaston), (1928), <i>Essai sur la connaissance approche</i> , Paris, Librairie Philosophique J. Vrin	1928
Robinson, C. E. (1932). <i>Straw votes: A study political prediction</i> . New York, NY: Columbia University Press	1932
Knight, F. H. (1933). <i>Risk, uncertainty profit</i> . London: London School Economics Political Science	1933
Schumpeter, J. A. (1912). 1934. <i>The theory of economic development</i>	1934
Gaston, B. (1934). <i>Le nouvel esprit scientifique</i> . Paris, Alcan	1934
Schumpeter J. (1934). <i>Theory Economic Development: An Inquiry into Profits, Capital, Interest, Business Cycle</i> . Redvers Opie (trans). Harvard University Press: Cambridge, MA	1934
Schumpeter, J. A. (1934). <i>Theory economic development: An inquiry into profits, capital, credit, interest business cycle</i>	1934
Enriques, F., Renaud, P., Bouligand, G., and Lacape, R. S. (1935). <i>Signification de l'histoire de la pensée scientifique</i>	1935
Hayek, F. (1935). <i>Collectivist economic planning: Critical studies possibilities socialism</i> . London, United Kingdom: Routledge	1935

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Table A.2 (continued)

Title	Year
Lewin, K. (1935). <i>A dynamic theory personality</i> McGraw Hill. New York	1935
Bachelard, G. (1936). <i>Critique préliminaire du concept de frontière épistémologique</i> . Actes du huitième Congrès International de Philosophie, 3–9	1936
Bachelard (G), (1936). <i>Le Surrationalisme</i> , dans <i>Inquisitions</i> [revue], repris dans tudes, Paris, Librairie Philosophique J. Vrin, (1970)	1936
Blondel, M. (1936). <i>L'action</i>	1936
Coase, Ronald H. (1937) <i>The Nature Firm</i> , <i>Economica</i> , 4, New Series, November, pp. 386-405	1937
Blondel, M. (1937). <i>L'Être et les êtres</i>	1937
Bachelard (G.), (1938), <i>La Formation lesprit scientifique</i> , Paris, Librairie J. Vrin	1938
Barnard, C. (1938). <i>Functions executive</i> . Cambridge, MA: Harvard Univ. Press	1938
Hayek, F. (1939). <i>Economic conditions interstate federalism</i> . <i>Commonwealth Quarterly</i> , 5(2), 131–149	1939
Morin, E., (1939), <i>la methode</i> . 1. <i>La nature la nature</i> . Editions du Seuil, (1977)	1939
Schumpeter J. (1939). <i>Business Cycles: A Theoretical, Historical Statistical Analysis Capitalist Process</i> . McGraw-Hill Books: New York	1939
Bachelard, G. (1940). <i>La Philosophie du non, essai d'une philosophie du nouvel esprit scientifique par Gaston Bachelard</i> . Presses universitaires de France	1940
Follett, M. P. (1940). <i>Dynamic administration</i> . In H. C. Metcalf and L. Ulwick (Eds.), <i>collected papers Mary Parker Follett</i> . New York: Harper & Brothers	1940
Schumpeter, J.A., (1942). <i>Capitalism, Socialism Democracy</i> . Harper, New York	1942
Craik, K. (1943) <i>Nature Explanation</i> . Cambridge: Cambridge University Press	1943
Goodman, Nelson. (1943) <i>Simplicity Idea</i> . <i>Journal Symbolic Logic</i> , 8, 107–121	1943
Hayek, F. (1944). <i>Road to serfdorm</i> . London, United Kingdom: Routledge	1944
Rueff, J. (1946). <i>L'Ordre socia</i> . Paris: Librairie Medicis	1946
Max, W. (1947). <i>The theory of social and economic organization</i> . Translated by AM Henderson and Talcott Parsons. Edited with an introduction by Talcott Parsons.) <i>The Free Press of Glencoe Collier-Macmillan Limited</i> . London	1947
Gibb, C. A. (1947). <i>Principles traits leadership</i> . <i>Journal Abnormal Social Psychology</i> , 42, 267–284	1947
Simon, H. A. (1947). <i>Administrative behavior: A study decisionmaking processes administrative organizations</i> . New York: Free Press	1947
Simon, H.A. (1947), <i>Administrative Behavior: A Study Decision-making Processes Administrative Organizations</i> , Macmillan, Chicago, IL	1947
C. E. Shannon, <i>A Mathematical Theory Communication</i> , <i>Bell System Technical Journal</i> , 27, 379, (1948)	1948
Wiener, N. (1948) <i>Cybernetics; or, Control Communication Animal Machine</i> . Cambridge, MA: MIT Press	1948
Bachelard, G. (1949). <i>Le rationalisme appliqué</i> (Vol. 43). Paris: Presses universitaires de France	1949

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Table A.2 (continued)

Title	Year
Comte, A., and Le Verrier, C. (1949). <i>Cours de philosophie positive: discours sur l'esprit positif</i> . Librairie Garnier Freres	1949
Follett, M. P. (1949). <i>Basis authority</i> . In L. Urwick (Ed.), <i>Freedom and co-ordination: Lectures business organization</i> by Mary Parker Follett (pp. 3446). London: Management Publications Trust, Ltd.	1949
Hebb, D. O. (1949). <i>Organization behaviour</i> . New York: John Wiley & Sons	1949

Table A.3 Pioneering publications: the American school

Title	Year
Nash, J. F. (1950). <i>Equilibrium points in n-person games</i> . <i>Proceedings of the national academy of sciences</i> , 36(1), 48–49	1950
Kahn, Herman (1960) <i>On Thernonuclear War: Thinking About the Unthinkable</i> Princeton, NJ: Princeton University Press	1960
Dalkey, N., and Helmer, O. (1963). <i>An experimental application of the Delphi method to the use of experts</i> . <i>Management science</i> , 9(3), 458–467	1963
Gordon, T. J., and Helmer, O. (1964). <i>Report on a long-range forecasting study (No. P-2982)</i> . RAND CORP SANTA MONICA CALIF	1964
T.J. Gordon. <i>The Delphi method</i> , (1964), AC/UNU millennium project	1964
Bell, D. (1965). <i>The study of the future</i> . <i>The Public Interest</i> , (1), 119	1965
Kahn, H. (1965). <i>On Escalation: Metaphors and Scenarios</i> (Prager)	1965
Kahn, H. (1966). <i>The alternative world futures approach</i> . Hudson Institute	1966
Kahn, H. (1966). <i>Nuclear Proliferation and Rules of Retaliation</i> . <i>Yale LJ</i> , 76, 77	1966
Helmer, O., BROWN, B., and Gordon, T. J. (1966). <i>Social Technology</i> . [By] Olaf Helmer.[With] Contributions by Bernice Brown, Theodore Gordon. Basic Books	1966
Thompson, J. D. (1967). <i>Organizations in action: Social science bases of administrative theory</i> . New York: McGraw-Hill	1967
Thompson, J. D. (1967). <i>Organizations in action</i> . New York: McGraw-Hill	1967
Winthrop, H. (1968). <i>The Sociologist and the Study of the Future</i> . <i>The American Sociologist</i> , 136–145	1968
Durant, W., and Durant, A. (1968). <i>The lessons of history</i> . New York: Simon and Schuster	1968
Bright, J. R. (1968) <i>Technological forecasting for industry and government: Methods and applications</i> . Englewood Cliffs, NJ: Prentice-Hall	1968
Gordon, T. J., and Hayward, H. (1968). <i>Initial experiments with the cross-impact matrix method of forecasting</i> . <i>Futures</i> , 1(2), 100–116	1968
Kahn, H. (1969). <i>The Case for a Thin System</i> . In <i>Why ABM</i> (pp. 63-90)	1969
Toffler, A. (1970). <i>Future Shock</i> . New York: Bantam Books	1970
Kahn, H., and Bruce-Briggs, B. (1972). <i>THINGS TO COME; THINKING ABOUT THE SEVENTIES AND EIGHTIES</i>	1972
Toffler, A. (1972). <i>The futurists</i> . Random House (NY)	1972

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Table A.3 (continued)

Title	Year
T.J. Gordon, H. Hayward, (1972), Initial experiments with the cross-impact matrix method of forecasting	1972
Thompson, J. D. (1974). Technology, polity, and societal development. <i>Administrative Science Quarterly</i> , 6–21	1974
Bell, D. (1974). Coming of post-industrial society-venture in social forecasting-reply. <i>CONTEMPORARY SOCIOLOGY-A JOURNAL OF REVIEWS</i> , 3(2), 107–109	1974
T. Gordon, J. Stover, (1975), Using perceptions and data about the future to improve the simulation of complex systems,	1975
T.J. Gordon, H. Hayward, (1977), Initial experiments with the cross-impact matrix method of forecasting	1977
G. Burt, G. Wright, R. Bradfield, K. van der Heijden, (1979), Limitations of PEST and its derivatives to understanding the environment: the role of scenario thinking in identifying environmental discontinuities and managing the future	1979

Table A.4 Pioneering publications: the French school

Title	Year
Blondel, C. (1914). <i>La conscience morbide</i> (Vol. 32). Alcan	1914
Blondel, C. (1928). <i>Introduction à la psychologie collective</i> (Collection Armand Colin, Tome 102.)	1928
Blondel, M. (1928). <i>L'itinéraire philosophique de Maurice Blondel</i> (Vol. 5). Éditions Spes	1928
Henri, B. (1934). <i>La pensée et le mouvant</i> . PUF, 91e édition, 166	1934
Blondel, M. (1936). <i>L'action</i>	1936
Bachelard, G. (1938). <i>The psychoanalysis of fire</i> . Boston, MA, Beacon. First published	1938
Gaston, B. (1938). <i>La formation de l'esprit scientifique</i> . Paris, Vrin, 1993	1938
Bergson, H., & Andison, M. L. (1946). <i>The Creative Mind: an Introduction to Metaphysics</i> . [La Pensée et le mouvant, 1934]. Trans. Mabelle L. Andison. New York: Philosophical Society	1946
Gaston, B. (1951). <i>L'activité rationaliste de la physique contemporaine</i> . Paris, PUF	1951
Gignoux, C.-J. (1952). <i>La Renaissance allemande</i> . <i>La Revue des deux mondes</i> , 129(10)	1952
De Jouvenel, B. (1952). <i>Power: The natural history of its growth</i> . London, Batchworth P	1952
Touraine, A. (1955). <i>L'évolution du travail ouvrier aux usines Renault</i> (Vol. 1055). Centre national de la recherche scientifique	1955
Boulding, K. E. (1956). <i>General systems theory—the skeleton of science</i> . <i>Management science</i> , 2(3), 197–208	1956
Berger, G. (1957). <i>Sciences humaines et prévision</i> . <i>Revue des Deux Mondes</i> (1829-1971), 417–426	1957
Aron, R. (1957). <i>Espoir et peur du siècle: essais non-partisans</i> . Calmann-Lévy [1957]	1957
Bergson, H. (1957). <i>Écrits et paroles: 1878-1904</i> (Vol. 1). Presses universitaires de France	1957

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Table A.4 (continued)

Title	Year
Berger, G. (1958). Humanisme et technique. <i>Revue de l'enseignement supérieur</i> , 1, 5–10	1958
Couturat, L. (1961). Opuscules et fragments inédits de Leibniz. Рипол Классик	1961
De Jouvenel, B. (1961). The chairman's problem. <i>American Political Science Review</i> , 55(2), 368–372	1961
De Jouvenel, B. (1963). The pure theory of politics. University Press	1963
MOROT-SIR, E. P., and BERGER, G. (1964). Phénoménologie du temps et de la prospective	1964
de Jouvenel, B. (Ed.). (1965). Futuribles: studies in conjecture (Vol. 2). Droz	1965
De Jouvenel, B. (1965). Political science and prevision. <i>American Political Science Review</i> , 59(1), 29–38	1965
Touraine, A. (1965). Sociologie de l'action. Paris: Editions du Seuil	1965
Gaston, B. (1967). Etapes de la prospective. Presses Universitaires de France	1967
De Jouvenel, B., and Viciani, F. (1967). L'arte della congettura. Vallecchi	1967
Massé, A. (1967). Le Plan ou l'anti-hasard (Paris: Gallimard). Google Scholar	1967
De Jouvenel, B. (1968). Arcadie: essais sur le mieux-vivre. Sedes	1968
Bachelard, G. (1968). La philosophie du non, Presses Universitaires de France, 1940. English translation by GC Waterston. Orion Press, New York, 93, 1955–1956	1968
De'Paratesi, N. G. (1969). Le brutte parole: Semantica dell'eufemismo. 3. A. Mondadori	1969
Datar, (1969), Prospective et analyse de systèmes, colección «Travaux et Recherches de Prospective»	1969
Jantsch, E. (1970). From forecasting and planning to policy sciences. <i>Policy Sciences</i> , 1(1), 31–47	1970
Jantsch, E. (1970). Toward a methodology for systemic forecasting. <i>Technological Forecasting</i> , 1(4), 409–419	1970
Bachelard, G. (1971). The poetics of reverie: Childhood, language, and the cosmos (Vol. 375). Beacon Press	1971
Datar, (1971), Scénarios d'aménagement du territoire. Essais méthodologiques	1971
Bachelard, G. (1972). Le Nouvel esprit scientifique et la création des valeurs rationnelles. <i>L'Engagement rationaliste</i> , 120–136	1972
Helmer, O. (1972). Cross-impact gaming. <i>Futures</i> , 4(2), 149–167	1972
Duperrin, J. C., and Godet, M. (1973). Methode de hierarchisation des elements d'un systeme. <i>Rapport économique du CEA</i> , 1(2), 49–51	1973
Touraine, A., and Bussi, R. (1974). La società post-industriale. Il mulino	1974
Julien, P. A., Lamonde, P., and Latouche, D. (1975). La méthode des scénarios en prospective. <i>L'Actualité économique</i> , 51(2), 253–281	1975
Decouffé, A. C. (1976). Sociologie de la prévision: l'exemple de la prospective sociale en France. Presses universitaires de France	1976

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Table A.4 (continued)

Title	Year
Godet, M. (1976). SMIC 74: A reply from the authors. <i>Futures</i> , 8(4), 336–340	1976
INTERFUTURS, (1976), Research project on the future development of advanced industrial societies in harmony with developing countries. Final report, Paris	1976
Godet, M., and Maalouf, A. (1977). Nucléaire tout est joué sauf si.. <i>Economica</i>	1977
DATAR, L. (1975). Méthode des scénarios. Une réflexion sur la démarche et la théorie de la prospective	1977
Godet, M., and Lesourne, J. P. (1977). Crise de la prévision, essor de la prospective: exemples et méthodes. Presses universitaires de France	1977
Godet, (1977), Michel. “Vive Descartes!. Halte à la complication du complexe”. <i>Futuribles</i> , Paris	1977
Bachelard, G. (1979). L'eau et les rêves. Services converti-braille Cypihot-Galarneau	1979
Godet, M. (1979). The crisis in forecasting and the emergence of the "prospective" approach: with case studies in energy and air transport. Pergamon Press	1979

Appendix B

To combine the FCM and TIA methods, besides the initialization vector and the matrix of causal relations from Tables 6.2 and 6.3 (respectively), the application of the TIA method requires the construction of two corresponding matrices that represent the endo and exo-signals that influence on system of interest (Table B.1).

Table B.2 shows the table of endo and exo-signals with positive impacts on the CBA system.

Table B.3 shows the table of endo and exo-signals with negative impacts on the CBA system.

For the experimental application in the CBA case, Tables B.2 and B.3 show a summary of the list of trends with a generic denomination of events from EV1 to EV5, which correspond to a trend for every strategic issue that was defined in the strategic design. This is a product of the previous moments of the strategic reflection's deployment. Linguistic variables are used to express the degree of probability and impact, as shown in Table B.1. These results are the product of discussions and consensus among those involved in the process of long-term strategic reflection.

Table B.1 Tags for linguistic variables

Tags to grade the influence/impact	Alias
Extremely negative	EN
Very negative	VN
Moderately negative	MN
Slightly negative	SN
Neutral	N
Slightly positive	SP
Moderately positive	MP
Very positive	VP
Extremely positive	EP

Source Adapted from Trujillo-Cabezas, (2018a, 2018b)

Table B.2 Matrix of positive trends

List of events for every variable	Pos. occurrence	Years for max impact	Max impact	Years for residual impact	Residual impact
EV1	High	5	EP	8	VP
EV2	High	3	EP	5	VP
EV3	High	2	EP	6	VP
EV4	High	5	EP	8	VP
EV5	High	3	EP	5	VP

Source Adapted from Trujillo-Cabezas (2018a)

Table B.3 Matrix of negative trends

List of events for every variable	Pos. occurrence	Years for max impact	Max impact	Years for residual impact	Residual impact
EV1	High	1	VN	6	MN
EV2	Very high	2	EN	5	VN
EV3	Medium	2	VN	8	MN
EV4	Very high	3	EN	6	MN
EV5	Medium	3	VN	6	MN

Source Adapted from Trujillo-Cabezas (2018a)

Table B.4 Morphological analysis matrix for the CBA

Strategic variables	H1	H2	H3	H4	H5
S1	1.075	0.78	1.123	0.881	1.151
S2	1.321	1.292	1.297	1.157	1.329
S3	1.717	1.680	1.686	1.504	1.728
S4	2.232	2.183	2.192	1.955	2.246
S5	2.902	2.839	2.850	2.542	2.920

Source Adapted from Trujillo-Cabezas (2018a)

By using the morphological analysis method in the process of scenario building, its application is oriented towards the elaboration of a matrix of future hypotheses that express future states for each strategic issue. The hypotheses can integrate qualitative and quantitative elements. Combining the FCM and TIA methods, it is necessary to create a matrix of hypotheses to be presented quantitatively, as shown in Table B.4.

The relative values for each of the future hypotheses are linked to the initialization vector that represents the system’s current situation. Therefore, in the process of creating futuribles, those involved in the process of long-term strategic reflection can estimate the degree of relative change for every strategic issue. The strategic

prospective process for the CBA continues according to what was defined in Chap. 6 with the H5, H5, H4, H5, H5 combination.

To fulfil the first purpose of the experimental application of TSC with regard to the evaluation of the strategic design 2016, Table B.5 shows the initialization vector for the 11 strategic focal points.

Table B.6 shows the matrix of positive impacts for the 11 strategic focal points of the strategic design 2016.

Table B.7 shows the matrix of negative impacts for the 11 strategic issues of the strategic design 2016.

For the experimental application of TSC, Table B.8 below shows the initialization vector for the FCM in every case, which, together with the matrices of positive and negative impacts shown in Tables B.9 and B.10, comprise the inputs for the combined application of the FCM and TIA methods. These inputs are associated with the second purpose of the experimental application, namely, to use the Meta-Prospective model.

Table B.9 shows the endo and exo-signals with their positive impacts on the TSC system.

Table B.10 shows the endo and exo-signals with their negative impacts on the TSC system.

The FCM causal relations matrix of experimental application on the TSC is shown below in Table B.11. The relations are expressed through linguistic variables according to Table B.1

The range of future hypotheses to create the morphological space, following the decisions of those involved in envisioning the future, includes four alternatives, as shown in Table B.12. H1 represents the medium situation, i. e., the trajectory that combines the positive and negative impacts. H2 represents the trajectory with positive impacts. H3 is a transformational alternative that is superior to H2. And, finally, H4 represents a rupture situation.

Table B.5 Initialization vector for TSC

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
0.70	0.70	0.60	0.70	0.50	0.70	0.50	0.50	0.23	0.70	0.50

Source Adapted from Trujillo-Cabezas (2018b)

Table B.6 Matrix of positive trends

Events	Pos. occurrence	Years for max impact	Max impact	Years for residual impact	Residual impact
EV1	High	5	VP	9	MP
EV2	Very high	3	EP	7	MP
EV3	Very high	2	EP	8	MP
EV4	Very high	2	EP	6	MP
EV5	High	2	MP	5	SP
EV6	High	2	VP	4	MP
EV7	High	4	VP	8	MP
EV8	High	5	EP	9	MP
EV9	Very high	2	EP	8	MP
EV10	Very high	2	EP	8	MP
EV11	Very high	2	EP	8	SP

Source Adapted from Trujillo-Cabezas (2018b)

Table B.7 Matrix of negative trends

Events	Pos. occurrence	Years for max impact	Max impact	Years for residual impact	Residual impact
EV1	Very high	2	VN	4	EN
EV2	High	2	VN	4	VN
EV3	High	3	VN	5	VN
EV4	Medium	1	VN	3	EN
EV5	Medium	2	MN	4	MN
EV6	Medium	3	MN	5	SN
EV7	High	2	VN	4	EN
EV8	Medium	2	EN	4	EN
EV9	High	1	VN	3	VN
EV10	Medium	2	VN	4	VN
EV11	High	3	MN	5	MN

Source Adapted from Trujillo-Cabezas (2018b)

Table B.8 Initialization vector for the TSC

S1	S2	S3	S4	S5	S6	S7	S8
0.31	0.31	0.51	0.51	0.11	0.51	0.11	0.51

Source Adapted from Trujillo-Cabezas (2018b)

Table B.10 Matrix of positive trends for the TSC

List of events for every variable	Pos. occurrence	Years for max impact	Max impact	Years for residual impact	Residual impact
EV1	High	1	EP	5	SP
EV2	High	4	EP	8	MP
EV3	Very high	2	EP	5	MP
EV4	High	5	VP	10	MP
EV5	Very high	1	MP	5	MP
EV6	Very high	3	MP	5	MP
EV7	High	5	EP	5	EP
EV8	High	2	EP	5	EP

Source Adapted from Trujillo-Cabezas (2018b)

Table B.10 Matrix of negative trends for the TSC

List of events for every variable	Pos. occurrence	Years for max impact	Max impact	Years for residual impact	Residual impact
EV1	High	2	EN	8	VN
EV2	High	5	EN	8	VN
EV3	Very High	2	EN	4	VN
EV4	Medium	2	MN	5	N
EV5	High	3	EN	8	VN
EV6	Medium	4	EN	8	VN
EV7	High	2	EN	8	VN
EV8	Very High	2	EN	4	VN

Source Adapted from Trujillo-Cabezas (2018b)

Table B.11 Matrix of FCM causal relations using linguistic variables for the TSC

Strategic variables	S1	S2	S3	S4	S5	S6	S7	S8
S1	X	EP	EP	EP	EP	MP	EP	EP
S2	MP	X	MP	EP	SP	N	MP	VP
S3	EP	EP	X	MP	SP	VP	VP	VP
S4	VP	EP	VP	X	VP	MP	EP	EP
S5	EP	MP	MP	N	X	VP	EP	SP
S6	EP	MP	VP	SP	VP	X	SP	SP
S7	N	SP	MP	MP	VP	N	X	VP
S8	N	N	VP	MP	N	N	N	X

Source Adapted from Trujillo-Cabezas (2018b)

Table B.12 Morphological analysis matrix for TSC

	H1	H2	H3	H4
S1	0.625	1.058	1.4	1.6
S2	0.767	1.228	2.3	3.5
S3	0.417	0.976	1.58	3.6
S4	1.206	1.206	2.1	3.5
S5	0.851	1.274	1.85	2.6
S6	0.896	1.117	1.477	2.8
S7	1.147	1.582	2.02	2.7
S8	1.028	1.582	2.1	3

Source Adapted from Trujillo-Cabezas (2018b)

References

Trujillo-Cabezas, R. (2018a). *Workshop whitepapers*. Panamá City.

Trujillo-Cabezas, R. (2018b). *Workshop whitepapers*. Cali, Colombia.

Bibliography

- Aristóteles. (1990). *Metafísica de Aristóteles. Edición trilingüe por Valentín García Yebra*. Madrid: Gredos.
- Aristóteles. (1995). *Física. Introducción, traducción y notas de Guillermo R. de Echandía*. Madrid: Gredos.
- Balmat, J., Lafont, F., Maifret, R., & Pessel, N. (2011). A decision-making system to maritime risk assessment. *Ocean Engineering*, 38(1), 171–176.
- Barnes, S. (1989). Holon statistics. *Journal of Physics: Condensed Matter*, 1.
- Capra, F. (1996). *The web of life: A new synthesis of mind and matter*. HarperCollins.
- Ceballos, B. (2016). *Modelos de decisión multi-criterio en entornos con incertidumbre: Estudio comparativo y aplicación* (Tesis Doctoral). Granada, España: Universidad de Granada.
- Creswell, J., Plano Clark, V., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research designs. In *Handbook of mixed methods in social and behavioral research*.
- Cunliffe, A. (2004). On becoming a critically reflexive practitioner. *Journal of Management Education*, 28(4), 407–426.
- Feyerabend, P. (1970). *Against method: outline of an anarchistic theory of knowledge*. University of Minnesota Press.
- Genetic Algorithms. (1993). In C. Reeves, & S. O. Sciences (Ed.). Coventry University.
- Godet, M., & Pacini, V. (1996). *De l'activité à l'emploi par l'insertion*. Paris: Cahiers de Lips.
- Gordon, T., Glenn, J., & Jakil, A. (2005). Frontiers of futures research: What's next? *Technological Forecasting and Social Change*, 72(9), 1064–1069.
- Gray, S., Zanre, E., & Gray, S. (2014). Fuzzy cognitive maps as representations of mental models and group beliefs. *Fuzzy cognitive maps for applied sciences and engineering* (pp. 29–48). Berlin: Springer.
- Greeuw, S. C., van Asselt, M. B., Grosskurth, J., Storms, C. A., Rijkens-Klomp, N., Rothman, D., et al. (2000). *Cloudy crystal balls*. Copenhagen, Denmark: Agency, European Environment.
- Han, K., & Shin, J. (2014). A systematic way of identifying and forecasting technological reverse salients using QFD, bibliometrics, and trend impact analysis: A carbon nanotube biosensor case. *Technovation*, 34(9), 559–570.
- James, W. (1907). *Pragmatism, a New Name for Some Old Ways of Thinking*. (P. Lectures, Ed.). jesuismort.com. (n.d.). Retrieved octubre 3, 2018, from <https://www.jesuismort.com/tombe/jerome-monod#general>.
- Kuhn, T. (1957). *The Copernican Revolution*. Cambridge, MA: Harvard University Press.
- Kuhn, T. (1962). *Structure of Scientific Revolutions*. Chicago: University of Chicago Press.
- Küpers, W., Sonnenburg, S., & Zierold, M. (2017). *ReThinking management: Perspectives and impacts of cultural turns and beyond*. Berlin: Springer.

- Lakatos, I. (1970). Falsification and the methodology of scientific research programmes. *Criticism and the Growth of Knowledge*, 4, 91–196.
- Leenhardt, J. (1971). Pierre Bourdieu, Jean-Claude Chambo-redon, Jean-Claude Passeron, Le métier de sociologue. In *Annales. Économies, Sociétés, Civilisations*. In *Annales. Économies, Sociétés, Civilisations* (Vol. 26, pp. 234–235). EHESS.
- Masini, E. B. (1985, noviembre 29). Los estudios sobre el futuro no pueden ser deterministas. Retrieved octubre 2, 2017, from El País: https://elpais.com/diario/1985/11/29/sociedad/502066807_850215.html.
- Mintzberg, H. (1973). *The nature of managerial work*. New York, USA: Harper and Row.
- Mintzberg, H. (1978). *Patterns in strategy formation* (Vol. 24).
- Mintzberg, H., Raisinghani, D., & Theoret, A. (1976). The structure of “unstructured” decision processes. *Administrative Science Quarterly*, 246–275.
- Morin, E. (2006). Restricted complexity, general complexity. In C. Gershenson, A. Diederik, & E. Bruce (Eds.), *Worldviews, science and us: Philosophy and complexity* (pp. 1–25). World Scientific.
- Moru, E. (2006). *Epistemological obstacles in coming to understand the limit concept at undergraduate level: A case of the National University of Lesotho*. University of the Western Cape.
- Musgrave, A. (1970). *Criticism and the growth of knowledge* (Vol. 4). London: Cambridge University Press.
- Oates, W. (1948). *Basic Writings of St. Augustine* (2 Vols.)
- Patton, M. (1960). *Qualitative evaluation and research methods*. Newbury Park, CA: Sage.
- Pérez, G. (2009). *Heráclito a la luz de Edgar Morin: de la complejidad de la naturaleza a la naturaleza de la complejidad* (p. 9). Azafea: Revista de Filosofía.
- Phillips, E., & Pugh, D. (2007). *How to get a doctoral dissertation*. Maidenhead: Oxford University Press.
- Popper, K. (1945). *The open society and its enemies*. UK: Routledge.
- Schilperoord, M. (2005). Complexity in Foresight: experiences with INTERSECTIONS: An agent-based simulation workbench to help achieve adaptiveness in strategic planning.
- Sugeno, M. (1974). Theory of fuzzy integrals and its applications. Ph.D. Thesis. (T. I. Technology, Ed.) Tokyo.
- Tashakkori, A., & Teddlie, C. B. (1998). *Mixed methodology: Combining qualitative and quantitative approaches* (Vol. 46). London: Sage.
- Terano, T., & Sugeno, M. (1975). Conditional fuzzy measures and their applications. *Fuzzy sets and their applications to cognitive and decision processes* (pp. 151–170). New York: Academic Press.
- Turing, A. (1947). *The automatic computing engine*. London: Lecture to the London Mathematical Society.
- Zadeh, L. A. (1975). The concept of a linguistic variable and its application to approximate reasoning—I. *Information sciences*, 8(3), 199–249.