

---

# A New Approach to Computing Using *Informons* and Holons: Towards a Theory of Computing Science

Foundations of Science

pp 1–29 | Cite as

Article

**First Online:** 23 February 2019

---

## Abstract

The state of computing science and, particularly, software engineering and knowledge engineering is generally considered immature. The best starting point for achieving a mature engineering discipline is a solid scientific theory, and the primary reason behind the immaturity in these fields is precisely that computing science still has no such agreed upon underlying theory. As theories in other fields of science do, this paper formally establishes the fundamental elements and postulates making up a first attempt at a theory in this field, considering the features and peculiarities of computing science. The fundamental elements of this approach are *informons* and holons, and it is a general and comprehensive theory of software engineering and knowledge engineering that related disciplines (e.g., information systems) can particularise and/or extend to take benefit from it (Lakatos' concepts of core theory and protective belt theories).

## Keywords

Computing science theory Holarchy Holons *Informons* Postulates

---

This is a preview of subscription content, [log in](#) to check access.

---

## Notes

### Acknowledgements

We would like to thank La Caixa, for providing all the information regarding SIPBC and for funding project P021005-056, and Rachel Elliott (CETTICO: Centre of Computing and Communications Technology Transfer), for her help in translating this paper.

## Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## References

- Ackermann, R. J. (1989). The new experimentalism. *British Journal for the Philosophy of Science*, 40, 185–190.  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20new%20experimentalism&author=RJ.%20Ackermann&journal=British%20Journal%20for%20the%20Philosophy%20of%20Science&volume=40&pages=185-190&publication_year=1989) ([http://scholar.google.com/scholar\\_lookup?title=The%20new%20experimentalism&author=RJ.%20Ackermann&journal=British%20Journal%20for%20the%20Philosophy%20of%20Science&volume=40&pages=185-190&publication\\_year=1989](http://scholar.google.com/scholar_lookup?title=The%20new%20experimentalism&author=RJ.%20Ackermann&journal=British%20Journal%20for%20the%20Philosophy%20of%20Science&volume=40&pages=185-190&publication_year=1989))
- Alonso, F., Fernández, F., López, G., Rojas, J. P., & Soriano, F. J. (2001). Intelligent virtual agent societies on the internet. In A. de Antonio, R. Aylett, D. Ballin (Eds.), *Third international workshop, intelligent virtual agents* (Vol. 2190, pp. 100–111). LNCS Berlin: Springer.  
[Google Scholar](https://scholar.google.com/scholar?q=Alonso%2C%20F.%2C%20Fern%C3%A1ndez%2C%20F.%2C%20L%C3%B3pez%2C%20G.%2C%20Rojas%2C%20J.%20P.%2C%20%26%20Soriano%2C%20F.%20J.%20%282001%29.%20Intelligent%20virtual%20agent%20societies%20on%20the%20internet.%20In%20A.%20de%20Antonio%2C%20R.%20Aylett%2C%20D.%20Ballin%20%28Eds.%29%2C%20Third%20international%20workshop%2C%20Intelligent%20virtual%20agents%20%28Vol.%202190%2C%20pp.%20100%E2%80%93111%29.%20LNCS%20Berlin%3A%20Springer.)) ([https://scholar.google.com/scholar?q=Alonso%2C%20F.%2C%20Fern%C3%A1ndez%2C%20F.%2C%20L%C3%B3pez%2C%20G.%2C%20Rojas%2C%20J.%20P.%2C%20%26%20Soriano%2C%20F.%20J.%20%282001%29.%20Intelligent%20virtual%20agent%20societies%20on%20the%20internet.%20In%20A.%20de%20Antonio%2C%20R.%20Aylett%2C%20D.%20Ballin%20%28Eds.%29%2C%20Third%20international%20workshop%2C%20Intelligent%20virtual%20agents%20%28Vol.%202190%2C%20pp.%20100%E2%80%93111%29.%20LNCS%20Berlin%3A%20Springer.\)](https://scholar.google.com/scholar?q=Alonso%2C%20F.%2C%20Fern%C3%A1ndez%2C%20F.%2C%20L%C3%B3pez%2C%20G.%2C%20Rojas%2C%20J.%20P.%2C%20%26%20Soriano%2C%20F.%20J.%20%282001%29.%20Intelligent%20virtual%20agent%20societies%20on%20the%20internet.%20In%20A.%20de%20Antonio%2C%20R.%20Aylett%2C%20D.%20Ballin%20%28Eds.%29%2C%20Third%20international%20workshop%2C%20Intelligent%20virtual%20agents%20%28Vol.%202190%2C%20pp.%20100%E2%80%93111%29.%20LNCS%20Berlin%3A%20Springer.)))
- Alonso, F., López, G., Pazos, J., Rodríguez-Patón, A., Silva, A., & Soriano, F. J. (2004). Fundamental elements of a software design and construction theory: Informons and holons. In *Proceedings of the international symposium of Santa Caterina on challenges in the internet and interdisciplinary research (SSCCII)*, Italy (pp. 21–35).  
[Google Scholar](https://scholar.google.com/scholar?q=Alonso%2C%20F.%2C%20L%C3%B3pez%2C%20G.%2C%20Pazos%2C%20J.%2C%20Rodr%C3%ADguez-Pat%C3%B3n%2C%20A.%2C%20Silva%2C%20A.%2C%20%26%20Soriano%2C%20F.%20J.%20%282004%29.%20Fundamental%20elements%20of%20a%20software%20design%20and%20construction%20theory%3A%20Informons%20and%20holons.%20In%20Proceedings%20of%20the%20international%20symposium%20of%20Santa%20Caterina%20on%20challenges%20in%20the%20internet%20and%20interdisciplinary%20research%20%28SSCCII%29%2C%20Italy%20%28pp.%2021%E2%80%9335%29.)) ([https://scholar.google.com/scholar?q=Alonso%2C%20F.%2C%20L%C3%B3pez%2C%20G.%2C%20Pazos%2C%20J.%2C%20Rodr%C3%ADguez-Pat%C3%B3n%2C%20A.%2C%20Silva%2C%20A.%2C%20%26%20Soriano%2C%20F.%20J.%20%282004%29.%20Fundamental%20elements%20of%20a%20software%20design%20and%20construction%20theory%3A%20Informons%20and%20holons.%20In%20Proceedings%20of%20the%20international%20symposium%20of%20Santa%20Caterina%20on%20challenges%20in%20the%20internet%20and%20interdisciplinary%20research%20%28SSCCII%29%2C%20Italy%20%28pp.%2021%E2%80%9335%29.\)](https://scholar.google.com/scholar?q=Alonso%2C%20F.%2C%20L%C3%B3pez%2C%20G.%2C%20Pazos%2C%20J.%2C%20Rodr%C3%ADguez-Pat%C3%B3n%2C%20A.%2C%20Silva%2C%20A.%2C%20%26%20Soriano%2C%20F.%20J.%20%282004%29.%20Fundamental%20elements%20of%20a%20software%20design%20and%20construction%20theory%3A%20Informons%20and%20holons.%20In%20Proceedings%20of%20the%20international%20symposium%20of%20Santa%20Caterina%20on%20challenges%20in%20the%20internet%20and%20interdisciplinary%20research%20%28SSCCII%29%2C%20Italy%20%28pp.%2021%E2%80%9335%29.)))
- Andrade, J., Ares, J., Garcia, R., Martinez, M. A., Pazos, J., & Suarez, S. (2015). A game theory based approach for building holonic virtual enterprises. *IEEE Trans Syst Man Cybern Syst*, 45(2), 291–302.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=A%20game%20theory%20based%20approach%20for%20building%20holonic%20virtual%20enterprises&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garcia&author=MA.%20Martinez&author=J.%20Pazos&author=S.%20Suarez&journal=IEEE%20Trans%20Syst%20Man%20Cybern%20Syst&volume=45&issue=2&pages=291-302&publication_year=2015) ([http://scholar.google.com/scholar\\_lookup?title=A%20game%20theory%20based%20approach%20for%20building%20holonic%20virtual%20enterprises&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garcia&author=MA.%20Martinez&author=J.%20Pazos&author=S.%20Suarez&journal=IEEE%20Trans%20Syst%20Man%20Cybern%20Syst&volume=45&issue=2&pages=291-302&publication\\_year=2015](http://scholar.google.com/scholar_lookup?title=A%20game%20theory%20based%20approach%20for%20building%20holonic%20virtual%20enterprises&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garcia&author=MA.%20Martinez&author=J.%20Pazos&author=S.%20Suarez&journal=IEEE%20Trans%20Syst%20Man%20Cybern%20Syst&volume=45&issue=2&pages=291-302&publication_year=2015))

Andrade, J., Ares, J., García, R., Pazos, J., Rodríguez, S., Rodríguez-Patón, A., et al. (2007). Towards a lessons learned system for critical software. *Reliability Engineering & System Safety*, 92(7), 902–913.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Towards%20a%20lessons%20learned%20system%20for%20critical%20software&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garc%3%ADa&author=J.%20Pazos&author=S.%20Rodr%3%ADguez&author=A.%20Rodr%3%ADguez-Pat%3%B3n&author=A.%20Silva&journal=Reliability%20Engineering%20%26%20System%20Safety&volume=92&issue=7&pages=902-913&publication_year=2007) ([http://scholar.google.com/scholar\\_lookup?title=Towards%20a%20lessons%20learned%20system%20for%20critical%20software&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garc%3%ADa&author=J.%20Pazos&author=S.%20Rodr%3%ADguez&author=A.%20Rodr%3%ADguez-Pat%3%B3n&author=A.%20Silva&journal=Reliability%20Engineering%20%26%20System%20Safety&volume=92&issue=7&pages=902-913&publication\\_year=2007](http://scholar.google.com/scholar_lookup?title=Towards%20a%20lessons%20learned%20system%20for%20critical%20software&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garc%3%ADa&author=J.%20Pazos&author=S.%20Rodr%3%ADguez&author=A.%20Rodr%3%ADguez-Pat%3%B3n&author=A.%20Silva&journal=Reliability%20Engineering%20%26%20System%20Safety&volume=92&issue=7&pages=902-913&publication_year=2007))

Andrade, J., Ares, J., García, R., Pazos, J., Rodríguez, S., & Silva, A. (2004a). A methodological framework for generic conceptualisation: problem-sensitivity in software engineering. *Information and Software Technology*, 46(10), 635–649.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=A%20methodological%20framework%20for%20generic%20conceptualisation%3A%20problem-sensitivity%20in%20software%20engineering&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garc%3%ADa&author=J.%20Pazos&author=S.%20Rodr%3%ADguez&author=A.%20Silva&journal=Information%20and%20Software%20Technology&volume=46&issue=10&pages=635-649&publication_year=2004) ([http://scholar.google.com/scholar\\_lookup?title=A%20methodological%20framework%20for%20generic%20conceptualisation%3A%20problem-sensitivity%20in%20software%20engineering&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garc%3%ADa&author=J.%20Pazos&author=S.%20Rodr%3%ADguez&author=A.%20Silva&journal=Information%20and%20Software%20Technology&volume=46&issue=10&pages=635-649&publication\\_year=2004](http://scholar.google.com/scholar_lookup?title=A%20methodological%20framework%20for%20generic%20conceptualisation%3A%20problem-sensitivity%20in%20software%20engineering&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garc%3%ADa&author=J.%20Pazos&author=S.%20Rodr%3%ADguez&author=A.%20Silva&journal=Information%20and%20Software%20Technology&volume=46&issue=10&pages=635-649&publication_year=2004))

Andrade, J., Ares, J., García, R., Pazos, J., Rodríguez, S., & Silva, A. (2004b). A methodological framework for viewpoint-oriented conceptual modeling. *IEEE Transactions on Software Engineering*, 30(5), 282–294.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=A%20methodological%20framework%20for%20viewpoint-oriented%20conceptual%20modeling&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garc%3%ADa&author=J.%20Pazos&author=S.%20Rodr%3%ADguez&author=A.%20Silva&journal=IEEE%20Transactions%20on%20Software%20Engineering&volume=30&issue=5&pages=282-294&publication_year=2004) ([http://scholar.google.com/scholar\\_lookup?title=A%20methodological%20framework%20for%20viewpoint-oriented%20conceptual%20modeling&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garc%3%ADa&author=J.%20Pazos&author=S.%20Rodr%3%ADguez&author=A.%20Silva&journal=IEEE%20Transactions%20on%20Software%20Engineering&volume=30&issue=5&pages=282-294&publication\\_year=2004](http://scholar.google.com/scholar_lookup?title=A%20methodological%20framework%20for%20viewpoint-oriented%20conceptual%20modeling&author=J.%20Andrade&author=J.%20Ares&author=R.%20Garc%3%ADa&author=J.%20Pazos&author=S.%20Rodr%3%ADguez&author=A.%20Silva&journal=IEEE%20Transactions%20on%20Software%20Engineering&volume=30&issue=5&pages=282-294&publication_year=2004))

Aristotle, W. D. (1966). *Aristotle's metaphysics (Aristotelous ta Meta ta Physika)*. Oxford: Clarendon Press.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Aristotle%20%28Aristotelous%20ta%20Meta%20ta%20Physika%29&author=WD.%20Aristotle&publication_year=1966) ([http://scholar.google.com/scholar\\_lookup?title=Aristotle%20%28Aristotelous%20ta%20Meta%20ta%20Physika%29&author=WD.%20Aristotle&publication\\_year=1966](http://scholar.google.com/scholar_lookup?title=Aristotle%20%28Aristotelous%20ta%20Meta%20ta%20Physika%29&author=WD.%20Aristotle&publication_year=1966))

Arsac, J. (1970). *La Science Informatique*, Paris, éditions Dunod.

[Google Scholar](https://scholar.google.com/scholar?q=Arsac%2C%20J.%20%281970%29.%20La%20Science%20Informatique%2C%20Paris%2C%20%28%C3%A9ditions%20Dunod.%29) (<https://scholar.google.com/scholar?q=Arsac%2C%20J.%20%281970%29.%20La%20Science%20Informatique%2C%20Paris%2C%20%28%C3%A9ditions%20Dunod.%29>)

Baader, F., Calvanese, D., McGuinness, D., Nardi, D., & Patel-Schneider, P. (Eds.). (2003). *The description logic handbook: Theory, implementation and*

*applications*. New York: Cambridge University Press.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20description%20logic%20handbook%3A%20Theory%2C%20Implementation%20and%20Applications&publication_year=2003) ([http://scholar.google.com/scholar\\_lookup?title=The%20description%20logic%20handbook%3A%20Theory%2C%20Implementation%20and%20Applications&publication\\_year=2003](http://scholar.google.com/scholar_lookup?title=The%20description%20logic%20handbook%3A%20Theory%2C%20Implementation%20and%20Applications&publication_year=2003))

Basili, V. R., Shull, F., & Lomubille, R. (1999). Building knowledge through families of experiments. *IEEE Transactions on Software Engineering*, 25(4), 456–473.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Building%20knowledge%20through%20families%20of%20experiments&author=VR.%20Basili&author=F.%20Shull&author=R.%20Lomubille&journal=IEEE%20Transactions%20on%20Software%20Engineering&volume=25&issue=4&pages=456-473&publication_year=1999) ([http://scholar.google.com/scholar\\_lookup?title=Building%20knowledge%20through%20families%20of%20experiments&author=VR.%20Basili&author=F.%20Shull&author=R.%20Lomubille&journal=IEEE%20Transactions%20on%20Software%20Engineering&volume=25&issue=4&pages=456-473&publication\\_year=1999](http://scholar.google.com/scholar_lookup?title=Building%20knowledge%20through%20families%20of%20experiments&author=VR.%20Basili&author=F.%20Shull&author=R.%20Lomubille&journal=IEEE%20Transactions%20on%20Software%20Engineering&volume=25&issue=4&pages=456-473&publication_year=1999))

Bateson, G. (1979). *Mind and nature: A necessary unity*. New York: Bantam Books.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Mind%20and%20nature%3A%20A%20necessary%20unity&author=G.%20Bateson&publication_year=1979) ([http://scholar.google.com/scholar\\_lookup?title=Mind%20and%20nature%3A%20A%20necessary%20unity&author=G.%20Bateson&publication\\_year=1979](http://scholar.google.com/scholar_lookup?title=Mind%20and%20nature%3A%20A%20necessary%20unity&author=G.%20Bateson&publication_year=1979))

Bayes, T. (1763). An essay toward solving a problem in the doctrine of chances. *Philosophical Transactions of the Royal Society of London*, 53, 370–418.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=An%20essay%20toward%20solving%20a%20problem%20in%20the%20doctrine%20of%20chances&author=T.%20Bayes&journal=Philosophical%20Transactions%20of%20the%20Royal%20Society%20of%20London&volume=53&pages=370-418&publication_year=1763) ([http://scholar.google.com/scholar\\_lookup?title=An%20essay%20toward%20solving%20a%20problem%20in%20the%20doctrine%20of%20chances&author=T.%20Bayes&journal=Philosophical%20Transactions%20of%20the%20Royal%20Society%20of%20London&volume=53&pages=370-418&publication\\_year=1763](http://scholar.google.com/scholar_lookup?title=An%20essay%20toward%20solving%20a%20problem%20in%20the%20doctrine%20of%20chances&author=T.%20Bayes&journal=Philosophical%20Transactions%20of%20the%20Royal%20Society%20of%20London&volume=53&pages=370-418&publication_year=1763))

Bloch, A. (1990). *The complete murphy's law*. Los Angeles: Price Stern Sloan Inc.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20complete%20murphy%E2%80%99s%20law&author=A.%20Bloch&publication_year=1990) ([http://scholar.google.com/scholar\\_lookup?title=The%20complete%20murphy%E2%80%99s%20law&author=A.%20Bloch&publication\\_year=1990](http://scholar.google.com/scholar_lookup?title=The%20complete%20murphy%E2%80%99s%20law&author=A.%20Bloch&publication_year=1990))

Bresciani, P., Perini, A., Giorgini, P., Giunchiglia, F., & Mylopoulos, J. (2004). Tropos: an agent-oriented software development methodology. *Autonomous Agents and Multi-Agent Systems*, 8(3), 203–236.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Tropos%3A%20an%20agent-oriented%20software%20development%20methodology&author=P.%20Bresciani&author=A.%20Perini&author=P.%20Giorgini&author=F.%20Giunchiglia&author=J.%20Mylopoulos&journal=Autonomous%20Agents%20and%20Multi-Agent%20Systems&volume=8&issue=3&pages=203-236&publication_year=2004) ([http://scholar.google.com/scholar\\_lookup?title=Tropos%3A%20an%20agent-oriented%20software%20development%20methodology&author=P.%20Bresciani&author=A.%20Perini&author=P.%20Giorgini&author=F.%20Giunchiglia&author=J.%20Mylopoulos&journal=Autonomous%20Agents%20and%20Multi-Agent%20Systems&volume=8&issue=3&pages=203-236&publication\\_year=2004](http://scholar.google.com/scholar_lookup?title=Tropos%3A%20an%20agent-oriented%20software%20development%20methodology&author=P.%20Bresciani&author=A.%20Perini&author=P.%20Giorgini&author=F.%20Giunchiglia&author=J.%20Mylopoulos&journal=Autonomous%20Agents%20and%20Multi-Agent%20Systems&volume=8&issue=3&pages=203-236&publication_year=2004))

Brooks, F. P. (1996). The computer scientist as toolsmith II. *Communications of the ACM*, 39(3), 61–68.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20computer%20scientist%20as%20toolsmith%20II&author=FP.%20Brooks&journal=Communications%20of%20the%20ACM&volume=39&issue=3&pages=61-68&publication_year=1996) ([http://scholar.google.com/scholar\\_lookup?title=The%20computer%20scientist%20as%20toolsmith%20II&author=FP.%20Brooks&journal=Communications%20of%20the%20ACM&volume=39&issue=3&pages=61-68&publication\\_year=1996](http://scholar.google.com/scholar_lookup?title=The%20computer%20scientist%20as%20toolsmith%20II&author=FP.%20Brooks&journal=Communications%20of%20the%20ACM&volume=39&issue=3&pages=61-68&publication_year=1996))

Caraça-Valente, J. P., Gómez-Pérez, A., Juristo, N., & Pazos, J. (1993). The holistic side of the serendipitous effect and artificial intelligence. In *Proceedings of the 5th UNB artificial intelligence symposium*, Canada (pp. 309–319).

[Google Scholar](https://scholar.google.com/scholar?q=Cara%20Valente%20J.%20P.%20G%C3%B3mez-P%C3%A9rez%20A.%20Juristo%20N.%20Pazos%20J.) (<https://scholar.google.com/scholar?q=Cara%20Valente%20J.%20P.%20G%C3%B3mez-P%C3%A9rez%20A.%20Juristo%20N.%20Pazos%20J.>)

%20%281993%29.%20The%20holistic%20side%20of%20the%20serendipitous%20effect%20and%20artificial%20intelligence.%20In%20Proceedings%20of%20the%205th%20UNB%20artificial%20intelligence%20symposium%2C%20Canada%20%28pp%2C%20309%E2%80%93319%29.)

Crick, F. H. C. (1990). *What mad pursuit: A personal view of scientific discovery*. London: Penguin Books.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=What%20mad%20pursuit%3A%20A%20personal%20view%20of%20scientific%20discovery&author=FHC.%20Crick&publication_year=1990) ([http://scholar.google.com/scholar\\_lookup?title=What%20mad%20pursuit%3A%20A%20personal%20view%20of%20scientific%20discovery&author=FHC.%20Crick&publication\\_year=1990](http://scholar.google.com/scholar_lookup?title=What%20mad%20pursuit%3A%20A%20personal%20view%20of%20scientific%20discovery&author=FHC.%20Crick&publication_year=1990))

Denning, P. J. (2003). Great principles of computing. *Communications of the ACM*, 46(11), 15–20.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Great%20principles%20of%20computing&author=PJ.%20Denning&journal=Communications%20of%20the%20ACM&volume=46&issue=11&pages=15-20&publication_year=2003) ([http://scholar.google.com/scholar\\_lookup?title=Great%20principles%20of%20computing&author=PJ.%20Denning&journal=Communications%20of%20the%20ACM&volume=46&issue=11&pages=15-20&publication\\_year=2003](http://scholar.google.com/scholar_lookup?title=Great%20principles%20of%20computing&author=PJ.%20Denning&journal=Communications%20of%20the%20ACM&volume=46&issue=11&pages=15-20&publication_year=2003))

DMTF (Distributed Management Task Force), *Web-Based Enterprise Management (WBEM)*. (2003). *Technical report of the distributed management Task Force*, Inc.

[Google Scholar](https://scholar.google.com/scholar?q=DMTF%20%28Distributed%20Management%20Task%20Force%29%2C%20Web-Based%20Enterprise%20Management%20%28WBEM%29.%20%282003%29.%20Technical%20report%20of%20the%20distributed%20management%20Task%20Force%2C%20Inc.) (<https://scholar.google.com/scholar?q=DMTF%20%28Distributed%20Management%20Task%20Force%29%2C%20Web-Based%20Enterprise%20Management%20%28WBEM%29.%20%282003%29.%20Technical%20report%20of%20the%20distributed%20management%20Task%20Force%2C%20Inc.>)

Ebert, C. (1997). The road to maturity: Navigating between craft and science. *IEEE Software*, 14(6), 77–82.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20road%20to%20maturity%3A%20Navigating%20between%20craft%20and%20science&author=C.%20Ebert&journal=IEEE%20Software&volume=14&issue=6&pages=77-82&publication_year=1997) ([http://scholar.google.com/scholar\\_lookup?title=The%20road%20to%20maturity%3A%20Navigating%20between%20craft%20and%20science&author=C.%20Ebert&journal=IEEE%20Software&volume=14&issue=6&pages=77-82&publication\\_year=1997](http://scholar.google.com/scholar_lookup?title=The%20road%20to%20maturity%3A%20Navigating%20between%20craft%20and%20science&author=C.%20Ebert&journal=IEEE%20Software&volume=14&issue=6&pages=77-82&publication_year=1997))

Einstein, A. (1995). *Autobiografía y Escritos Científicos*. Barcelona: Círculo de Lectores S.A.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Autobiograf%C3%ADa%20y%20Escritos%20Cient%C3%ADficos&author=A.%20Einstein&publication_year=1995) ([http://scholar.google.com/scholar\\_lookup?title=Autobiograf%C3%ADa%20y%20Escritos%20Cient%C3%ADficos&author=A.%20Einstein&publication\\_year=1995](http://scholar.google.com/scholar_lookup?title=Autobiograf%C3%ADa%20y%20Escritos%20Cient%C3%ADficos&author=A.%20Einstein&publication_year=1995))

Fitzgerald, B., & Adam, F. (1996). The future of IS: Expansion or extinction? In *Proceedings of the first conference of the UK academy for information systems*, UK (pp. 1–15).

[Google Scholar](https://scholar.google.com/scholar?q=Fitzgerald%2C%20B.%2C%20%26%20Adam%2C%20F.%20%281996%29.%20The%20future%20of%20IS%3A%20Expansion%20or%20extinction%3F%20In%20Proceedings%20of%20the%20first%20conference%20of%20the%20UK%20academy%20for%20information%20systems%2C%20UK%20%28pp.%201%E2%80%9315%29.) (<https://scholar.google.com/scholar?q=Fitzgerald%2C%20B.%2C%20%26%20Adam%2C%20F.%20%281996%29.%20The%20future%20of%20IS%3A%20Expansion%20or%20extinction%3F%20In%20Proceedings%20of%20the%20first%20conference%20of%20the%20UK%20academy%20for%20information%20systems%2C%20UK%20%28pp.%201%E2%80%9315%29.>)

Foundation for Intelligent Physical Agents (FIPA). (1996). *FIPA Rationale*, [http://www.csel.stet.it/fipa/fipa\\_rationale.htm](http://www.csel.stet.it/fipa/fipa_rationale.htm) ([http://www.csel.stet.it/fipa/fipa\\_rationale.htm](http://www.csel.stet.it/fipa/fipa_rationale.htm)). Accessed Nov 2014.

Franklin, S., & Graesser, A. (1996). Is it an agent or just a program?: A taxonomy for autonomous agents. In *Proceedings of 3rd international workshop on agent*

*theories, architectures and languages*, Hungary (pp. 21–35).

[Google Scholar](https://scholar.google.com/scholar?q=Franklin%2C%20S.%2C%20%26%20Graesser%2C%20A.%20%281996%29.%20Is%20it%20an%20agent%20or%20just%20a%20program%3F%3A%20A%20taxonomy%20for%20autonomous%20agents.%20In%20Proceedings%20of%203rd%20international%20workshop%20on%20agent%20theories%2C%20architectures%20and%20languages%2C%20Hungary%20%28pp.%2021%20-%2080%29%29.) (https://scholar.google.com/scholar?q=Franklin%2C%20S.%2C%20%26%20Graesser%2C%20A.%20%281996%29.%20Is%20it%20an%20agent%20or%20just%20a%20program%3F%3A%20A%20taxonomy%20for%20autonomous%20agents.%20In%20Proceedings%20of%203rd%20international%20workshop%20on%20agent%20theories%2C%20architectures%20and%20languages%2C%20Hungary%20%28pp.%2021%20-%2080%29%29.)

Gervais, M. (2003). ODAC: An agent-oriented methodology based on ODP. *Autonomous Agents and Multi-Agent Systems*, 7(3), 199–228.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=ODAC%3A%20An%20agent-oriented%20methodology%20based%20on%20ODP&author=M.%20Gervais&journal=Autonomous%20Agents%20and%20Multi-Agent%20Systems&volume=7&issue=3&pages=199-228&publication_year=2003) (http://scholar.google.com/scholar\_lookup?title=ODAC%3A%20An%20agent-oriented%20methodology%20based%20on%20ODP&author=M.%20Gervais&journal=Autonomous%20Agents%20and%20Multi-Agent%20Systems&volume=7&issue=3&pages=199-228&publication\_year=2003)

Glaser, N. (1997). The CoMoMAS methodology and environment for multi-agent system development. In C. Zhang & D. Lukose (Eds.), *Multi-agent systems – Methodologies and applications* (Vol. 1286, pp. 1–16)., LNAI Springer: Berlin.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20CoMoMAS%20methodology%20and%20environment%20for%20multi-agent%20system%20development&author=N.%20Glaser&pages=1-16&publication_year=1997) (http://scholar.google.com/scholar\_lookup?title=The%20CoMoMAS%20methodology%20and%20environment%20for%20multi-agent%20system%20development&author=N.%20Glaser&pages=1-16&publication\_year=1997)

Gregor, S. (2006). The nature of theory in information systems. *MIS Quarterly*, 30(3), 611–642.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20nature%20of%20theory%20in%20information%20systems&author=S.%20Gregor&journal=MIS%20Quarterly&volume=30&issue=3&pages=611-642&publication_year=2006) (http://scholar.google.com/scholar\_lookup?title=The%20nature%20of%20theory%20in%20information%20systems&author=S.%20Gregor&journal=MIS%20Quarterly&volume=30&issue=3&pages=611-642&publication\_year=2006)

Gruber, T. R. (1993). A translation approach to portable ontologies. *Knowledge Acquisition*, 5(2), 199–220.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=A%20translation%20approach%20to%20portable%20ontologies&author=TR.%20Gruber&journal=Knowledge%20Acquisition&volume=5&issue=2&pages=199-220&publication_year=1993) (http://scholar.google.com/scholar\_lookup?title=A%20translation%20approach%20to%20portable%20ontologies&author=TR.%20Gruber&journal=Knowledge%20Acquisition&volume=5&issue=2&pages=199-220&publication\_year=1993)

Guralnik, D. (Ed.). (1986). *Webster's new world dictionary*. New York: Simon & Schuster.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Webster%20%281986%29%20new%20world%20dictionary&publication_year=1986) (http://scholar.google.com/scholar\_lookup?title=Webster%20%281986%29%20new%20world%20dictionary&publication\_year=1986)

Hacking, I. (1983). *Representing and intervening*. Cambridge: Cambridge University Press.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Representing%20and%20intervening&author=I.%20Hacking&publication_year=1983) (http://scholar.google.com/scholar\_lookup?title=Representing%20and%20intervening&author=I.%20Hacking&publication\_year=1983)

Hannay, J. E., Sjøberg, D. I. K., & Dybå, T. (2007). A systematic review of theory use in software engineering experiments. *IEEE Transactions on Software Engineering*, 33(2), 87–107.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=A%20systematic%20review%20of%20theory%20use%20in%20software%20engineering%20experiments&author=JE.%20Hannay&author=DIK.%20Sj%C3%B8berg&author=T.%20Dyb%C3%A5&journal=IEEE%20Transactions%20on%20Software%20Engineering&volume=33&issue=2&pages=87-107) (http://scholar.google.com/scholar\_lookup?title=A%20systematic%20review%20of%20theory%20use%20in%20software%20engineering%20experiments&author=JE.%20Hannay&author=DIK.%20Sj%C3%B8berg&author=T.%20Dyb%C3%A5&journal=IEEE%20Transactions%20on%20Software%20Engineering&volume=33&issue=2&pages=87-107)

issue=2&pages=87-107&publication\_year=2007)

Hartmanis, J. (1993). Some Observations About the Nature of Computer Science. In R. K. Shyamasundar (Ed.) *13th Conference on foundations of software technology and theoretical computer science*, LNCS, (Vol. 761, pp. 1–12). Berlin: Springer.

[Google Scholar](https://scholar.google.com/scholar?q=Hartmanis%2C%20J.%20%281993%29.%20Some%20Observations%20About%20the%20Nature%20of%20Computer%20Science.%20In%20R.%20K.%20Shyamasundar%20%28Ed.%29%2013th%20Conference%20on%20foundations%20of%20software%20technology%20and%20theoretical%20computer%20science%2C%20LNCS%2C%20%28Vol.%20761%2C%20pp.%201%E2%80%9312%29.%20Berlin%20Springer.) (<https://scholar.google.com/scholar?q=Hartmanis%2C%20J.%20%281993%29.%20Some%20Observations%20About%20the%20Nature%20of%20Computer%20Science.%20In%20R.%20K.%20Shyamasundar%20%28Ed.%29%2013th%20Conference%20on%20foundations%20of%20software%20technology%20and%20theoretical%20computer%20science%2C%20LNCS%2C%20%28Vol.%20761%2C%20pp.%201%E2%80%9312%29.%20Berlin%20Springer.>)

Hayzelden, A. L. G., & Bourne, R. A. (Eds.). (2001). *Agent technology for communication infrastructures*. New York: Wiley.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Agent%20technology%20for%20communication%20infrastructures&publication_year=2001) ([http://scholar.google.com/scholar\\_lookup?title=Agent%20technology%20for%20communication%20infrastructures&publication\\_year=2001](http://scholar.google.com/scholar_lookup?title=Agent%20technology%20for%20communication%20infrastructures&publication_year=2001))

Hilbert, D. (1900). *Mathematische Probleme*, Göttinger Nachrichten (Nachrichten von der Königlichen Gesellschaft der Wissenschaften zu Göttingen) (Vol. 3, pp. 253–297).

[Google Scholar](https://scholar.google.com/scholar?q=Hilbert%2C%20D.%20%281900%29.%20Mathematische%20Probleme%2C%20G%C3%B6ttinger%20Nachrichten%20%28Nachrichten%20von%20der%20K%C3%B6niglichen%20Gesellschaft%20der%20Wissenschaften%20zu%20G%C3%B6ttingen%29%20%28Vol.%203%2C%20pp.%20253%E2%80%93297%29.) (<https://scholar.google.com/scholar?q=Hilbert%2C%20D.%20%281900%29.%20Mathematische%20Probleme%2C%20G%C3%B6ttinger%20Nachrichten%20%28Nachrichten%20von%20der%20K%C3%B6niglichen%20Gesellschaft%20der%20Wissenschaften%20zu%20G%C3%B6ttingen%29%20%28Vol.%203%2C%20pp.%20253%E2%80%93297%29.>)

Huhns, M. N., & Singh, M. P. (1998). Agents and multiagent systems: Themes, approaches, and challenges. In M. N. Huhns & M. P. Singh (Eds.), *Readings in agents*. San Francisco: Morgan Kaufman Publishers.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Agents%20and%20multiagent%20systems%3A%20Themes%20Approaches%20and%20challenges&author=MN.%20Huhns&author=MP.%20Singh&publication_year=1998) ([http://scholar.google.com/scholar\\_lookup?title=Agents%20and%20multiagent%20systems%3A%20Themes%20Approaches%20and%20challenges&author=MN.%20Huhns&author=MP.%20Singh&publication\\_year=1998](http://scholar.google.com/scholar_lookup?title=Agents%20and%20multiagent%20systems%3A%20Themes%20Approaches%20and%20challenges&author=MN.%20Huhns&author=MP.%20Singh&publication_year=1998))

Iglesias, C. A., Garijo, M., González, J. C., & Velasco, J. R. (1998). Analysis and design of multiagent systems using MAS-CommonKADS. In M. P. Singh, A. S. Rao, & M. J. Wooldridge (Eds.), *Intelligent agents IV: Agent theories, architectures, and languages ATAL 97* (Vol. 1365, pp. 313–326)., LNAI Springer: Berlin.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Analysis%20and%20design%20of%20multiagent%20systems%20using%20MAS-CommonKADS&author=CA.%20Iglesias&author=M.%20Garijo&author=JC.%20Gonz%C3%A1lez&author=JR.%20Velasco&pages=313-326&publication_year=1998) ([http://scholar.google.com/scholar\\_lookup?title=Analysis%20and%20design%20of%20multiagent%20systems%20using%20MAS-CommonKADS&author=CA.%20Iglesias&author=M.%20Garijo&author=JC.%20Gonz%C3%A1lez&author=JR.%20Velasco&pages=313-326&publication\\_year=1998](http://scholar.google.com/scholar_lookup?title=Analysis%20and%20design%20of%20multiagent%20systems%20using%20MAS-CommonKADS&author=CA.%20Iglesias&author=M.%20Garijo&author=JC.%20Gonz%C3%A1lez&author=JR.%20Velasco&pages=313-326&publication_year=1998))

Jackson, M. (1995). *Software requirements and specifications. A lexicon of practice, principles and prejudices*. New York: ACM Press.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Software%20requirements%20and%20specifications.%20A%20lexicon%20of%20practice%2C%20principles%20and%20prejudices&author=M.%20Jackson&publication_year=1995) ([http://scholar.google.com/scholar\\_lookup?title=Software%20requirements%20and%20specifications.%20A%20lexicon%20of%20practice%2C%20principles%20and%20prejudices&author=M.%20Jackson&publication\\_year=1995](http://scholar.google.com/scholar_lookup?title=Software%20requirements%20and%20specifications.%20A%20lexicon%20of%20practice%2C%20principles%20and%20prejudices&author=M.%20Jackson&publication_year=1995))

James, W. (1907). *Pragmatism: A new name for some old ways of thinking*. New York: Longman Green and Co.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Pragmatism%3A%20A%20new%20name%20for%20some%20old%20ways%20of%20thinking) ([http://scholar.google.com/scholar\\_lookup?title=Pragmatism%3A%20A%20new%20name%20for%20some%20old%20ways%20of%20thinking](http://scholar.google.com/scholar_lookup?title=Pragmatism%3A%20A%20new%20name%20for%20some%20old%20ways%20of%20thinking))

&author=W.%20James&publication\_year=1907)

Koestler, A. (1967). *The ghost in the machine*. London: Hutchinson & Co.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

[/scholar\\_lookup?title=The%20ghost%20in%20the%20machine&author=A.%20Koestler&publication\\_year=1967](http://scholar.google.com/scholar_lookup?title=The%20ghost%20in%20the%20machine&author=A.%20Koestler&publication_year=1967))

Lage, J. (2004). *Definición de Especificaciones de una Memoria Institucional y Diseño de la Misma*, Ph.D. Dissertation, Technical University of Madrid.

[Google Scholar](https://scholar.google.com/scholar?q=Lage%2C%20J.%20%282004%29.%20Definici%C3%B3n%20de%20Especificaciones%20de%20una%20Memoria%20Institucional%20y%20Dise%C3%B1o%20de%20la%20Misma%2C%20Ph.D.%20Dissertation%2C%20Technical%20University%20of%20Madrid.) (<https://scholar.google.com/scholar?q=Lage%2C%20J.%20%282004%29.%20Definici%C3%B3n%20de%20Especificaciones%20de%20una%20Memoria%20Institucional%20y%20Dise%C3%B1o%20de%20la%20Misma%2C%20Ph.D.%20Dissertation%2C%20Technical%20University%20of%20Madrid.>)

Lakatos, I., & Musgrave, A. (1970). *Criticism and the growth of knowledge*.

Cambridge: Cambridge University Press.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

[/scholar\\_lookup?title=Criticism%20and%20the%20growth%20of%20knowledge&author=I.%20Lakatos&author=A.%20Musgrave&publication\\_year=1970](http://scholar.google.com/scholar_lookup?title=Criticism%20and%20the%20growth%20of%20knowledge&author=I.%20Lakatos&author=A.%20Musgrave&publication_year=1970))

Lenski, W. (2004). Towards a theory of information. In W. Lenski (Ed.), *Logic versus Approximation* (Vol. 3075, pp. 77–105)., LNCS Springer: Berlin.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

[/scholar\\_lookup?title=Towards%20a%20theory%20of%20information&author=W.%20Lenski&pages=77-105&publication\\_year=2004](http://scholar.google.com/scholar_lookup?title=Towards%20a%20theory%20of%20information&author=W.%20Lenski&pages=77-105&publication_year=2004))

Locke, J. (1801). *The works of John Locke*. London: J. Johnson.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

[/scholar\\_lookup?title=The%20works%20of%20John%20Locke&author=J.%20Locke&publication\\_year=1801](http://scholar.google.com/scholar_lookup?title=The%20works%20of%20John%20Locke&author=J.%20Locke&publication_year=1801))

Mackay, A. L. (1991). *A dictionary of scientific quotations. A harvest of a quiet eye*. New York: Adam Hilger.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

[/scholar\\_lookup?title=A%20dictionary%20of%20scientific%20quotations.%20A%20harvest%20of%20a%20quiet%20eye&author=AL.%20Mackay&publication\\_year=1991](http://scholar.google.com/scholar_lookup?title=A%20dictionary%20of%20scientific%20quotations.%20A%20harvest%20of%20a%20quiet%20eye&author=AL.%20Mackay&publication_year=1991))

Maes, P. (1995). Artificial life meets entertainment: Life like autonomous agents.

*Communications of the ACM*, 38(11), 108–114.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

[/scholar\\_lookup?title=Artificial%20life%20meets%20entertainment%3A%20Life%20like%20autonomous%20agents&author=P.%20Maes&journal=Communications%20of%20the%20ACM&volume=38&issue=11&pages=108-114&publication\\_year=1995](http://scholar.google.com/scholar_lookup?title=Artificial%20life%20meets%20entertainment%3A%20Life%20like%20autonomous%20agents&author=P.%20Maes&journal=Communications%20of%20the%20ACM&volume=38&issue=11&pages=108-114&publication_year=1995))

Markus, M. L., & Saunders, C. (2007). Looking for a few good concepts...and theories...for the information systems field. *MIS Quarterly*, 31(1), iii–vi.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

[/scholar\\_lookup?title=Looking%20for%20a%20few%20good%20concepts%20and%20theories%20for%20the%20information%20systems%20field&author=ML.%20Markus&author=C.%20Saunders&journal=MIS%20Quarterly&volume=31&issue=1&pages=iii-vi&publication\\_year=2007](http://scholar.google.com/scholar_lookup?title=Looking%20for%20a%20few%20good%20concepts%20and%20theories%20for%20the%20information%20systems%20field&author=ML.%20Markus&author=C.%20Saunders&journal=MIS%20Quarterly&volume=31&issue=1&pages=iii-vi&publication_year=2007))

Martínez, M. A. (2008). Una Teoría para el Desarrollo Software construida mediante técnicas y modelos de Gestión del Conocimiento. Thesis. Universidade da Coruña.



[Google Scholar](https://scholar.google.com/scholar?q=Mart%C3%ADnez%2C%20M.%20A.%20%282008%29.%20Una%20Teor%C3%ADa%20para%20el%20Desarrollo%20Software%20construida%20mediante%20t%C3%A9cnicas%20y%20modelos%20de%20Gesti%C3%B3n%20del%20Conocimiento.%20Thesis.%20Universidade%20da%20Coru%C3%B1a.) (<https://scholar.google.com/scholar?q=Mart%C3%ADnez%2C%20M.%20A.%20%282008%29.%20Una%20Teor%C3%ADa%20para%20el%20Desarrollo%20Software%20construida%20mediante%20t%C3%A9cnicas%20y%20modelos%20de%20Gesti%C3%B3n%20del%20Conocimiento.%20Thesis.%20Universidade%20da%20Coru%C3%B1a.>)

Martin-Flatin, J. P. (2003). *Web-based management of IP networks and systems*. New Jersey: Wiley.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Web-based%20management%20of%20IP%20networks%20and%20systems&author=JP.%20Martin-Flatin&publication_year=2003) ([http://scholar.google.com/scholar\\_lookup?title=Web-based%20management%20of%20IP%20networks%20and%20systems&author=JP.%20Martin-Flatin&publication\\_year=2003](http://scholar.google.com/scholar_lookup?title=Web-based%20management%20of%20IP%20networks%20and%20systems&author=JP.%20Martin-Flatin&publication_year=2003))

Meyer, B. (2001). Software engineering in the academy. *IEEE Computer*, 34(5), 28–35.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Software%20engineering%20in%20the%20academy&author=B.%20Meyer&journal=IEEE%20Computer&volume=34&issue=5&pages=28-35&publication_year=2001) ([http://scholar.google.com/scholar\\_lookup?title=Software%20engineering%20in%20the%20academy&author=B.%20Meyer&journal=IEEE%20Computer&volume=34&issue=5&pages=28-35&publication\\_year=2001](http://scholar.google.com/scholar_lookup?title=Software%20engineering%20in%20the%20academy&author=B.%20Meyer&journal=IEEE%20Computer&volume=34&issue=5&pages=28-35&publication_year=2001))

Moody, D., & Buist, A. (1999). Improving links between information systems research and practice—lessons from the medical profession. In *Proceedings of the 10th Australian conference on information systems*, New Zeland (pp. 645–659).

[Google Scholar](https://scholar.google.com/scholar?q=Moody%2C%20D.%2C%20%26%20Buist%2C%20A.%20%281999%29.%20Improving%20links%20between%20information%20systems%20research%20and%20practice-lessons%20from%20the%20medical%20profession.%20In%20Proceedings%20of%20the%2010th%20Australian%20conference%20on%20information%20systems%20New%20Zeland%20%28pp.%20645%E2%80%93659%29.) (<https://scholar.google.com/scholar?q=Moody%2C%20D.%2C%20%26%20Buist%2C%20A.%20%281999%29.%20Improving%20links%20between%20information%20systems%20research%20and%20practice-lessons%20from%20the%20medical%20profession.%20In%20Proceedings%20of%20the%2010th%20Australian%20conference%20on%20information%20systems%20New%20Zeland%20%28pp.%20645%E2%80%93659%29.>)

Morris, C. (1938). *Foundations of the theory of signs*. Chicago: University of Chicago Press.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Foundations%20of%20the%20theory%20of%20signs&author=C.%20Morris&publication_year=1938) ([http://scholar.google.com/scholar\\_lookup?title=Foundations%20of%20the%20theory%20of%20signs&author=C.%20Morris&publication\\_year=1938](http://scholar.google.com/scholar_lookup?title=Foundations%20of%20the%20theory%20of%20signs&author=C.%20Morris&publication_year=1938))

Nash, J. F. (1953). Two person cooperative game. *Econometrica*, 21(1953), 128–140.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Two%20person%20cooperative%20game&author=JF.%20Nash&journal=Econometrica&volume=21&issue=1953&pages=128-140&publication_year=1953) ([http://scholar.google.com/scholar\\_lookup?title=Two%20person%20cooperative%20game&author=JF.%20Nash&journal=Econometrica&volume=21&issue=1953&pages=128-140&publication\\_year=1953](http://scholar.google.com/scholar_lookup?title=Two%20person%20cooperative%20game&author=JF.%20Nash&journal=Econometrica&volume=21&issue=1953&pages=128-140&publication_year=1953))

Nwana, H. S. (1996). Software agents: An overview. *The Knowledge Engineering Review*, 11(3), 205–244.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Software%20agents%3A%20An%20overview&author=HS.%20Nwana&journal=The%20Knowledge%20Engineering%20Review&volume=11&issue=3&pages=205-244&publication_year=1996) ([http://scholar.google.com/scholar\\_lookup?title=Software%20agents%3A%20An%20overview&author=HS.%20Nwana&journal=The%20Knowledge%20Engineering%20Review&volume=11&issue=3&pages=205-244&publication\\_year=1996](http://scholar.google.com/scholar_lookup?title=Software%20agents%3A%20An%20overview&author=HS.%20Nwana&journal=The%20Knowledge%20Engineering%20Review&volume=11&issue=3&pages=205-244&publication_year=1996))

Nwana, H. S., & Wooldridge, M. (1996). Software agent technologies. *British Telecommunications Technology Journal*, 14(4), 68–78.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Software%20agent%20technologies&author=HS.%20Nwana&author=M.%20Wooldridge&journal=British%20Telecommunications%20Technology%20Journal&volume=14&issue=4&pages=68-78&publication_year=1996) ([http://scholar.google.com/scholar\\_lookup?title=Software%20agent%20technologies&author=HS.%20Nwana&author=M.%20Wooldridge&journal=British%20Telecommunications%20Technology%20Journal&volume=14&issue=4&pages=68-78&publication\\_year=1996](http://scholar.google.com/scholar_lookup?title=Software%20agent%20technologies&author=HS.%20Nwana&author=M.%20Wooldridge&journal=British%20Telecommunications%20Technology%20Journal&volume=14&issue=4&pages=68-78&publication_year=1996))

- Paggi, H., Lara, J. A., & Soriano, J. (2018). Structures generated in a multiagent system performing information fusion in peer-to-peer resource-constrained networks. *Neural Computing and Applications*. <https://doi.org/10.1007/s00521-018-3818-1> (<https://doi.org/10.1007/s00521-018-3818-1>).  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Structures%20generated%20in%20a%20multiagent%20system%20performing%20information%20fusion%20in%20peer-to-peer%20resource-constrained%20networks&author=H.%20Paggi&author=JA.%20Lara&author=J.%20Soriano&journal=Neural%20Computing%20and%20Applications&publication_year=2018&doi=10.1007%2Fs00521-018-3818-1) ([http://scholar.google.com/scholar\\_lookup?title=Structures%20generated%20in%20a%20multiagent%20system%20performing%20information%20fusion%20in%20peer-to-peer%20resource-constrained%20networks&author=H.%20Paggi&author=JA.%20Lara&author=J.%20Soriano&journal=Neural%20Computing%20and%20Applications&publication\\_year=2018&doi=10.1007%2Fs00521-018-3818-1](http://scholar.google.com/scholar_lookup?title=Structures%20generated%20in%20a%20multiagent%20system%20performing%20information%20fusion%20in%20peer-to-peer%20resource-constrained%20networks&author=H.%20Paggi&author=JA.%20Lara&author=J.%20Soriano&journal=Neural%20Computing%20and%20Applications&publication_year=2018&doi=10.1007%2Fs00521-018-3818-1))
- Paradela, L. F. (2003). *Una Metodología para la Gestión de Conocimientos*, Ph.D. Dissertation, Technical University of Madrid.  
[Google Scholar](https://scholar.google.com/scholar?q=Paradela%2C%20L.%20F.%20%282003%29.%20Una%20Metodolog%C3%ADa%20para%20la%20Gesti%C3%B3n%20de%20Conocimientos%2C%20Ph.D.%20Dissertation%2C%20Technical%20University%20of%20Madrid.) (<https://scholar.google.com/scholar?q=Paradela%2C%20L.%20F.%20%282003%29.%20Una%20Metodolog%C3%ADa%20para%20la%20Gesti%C3%B3n%20de%20Conocimientos%2C%20Ph.D.%20Dissertation%2C%20Technical%20University%20of%20Madrid.>)
- von Neumann, J., & Morgenstern, O. (1953). *Theory of games and economic behavior*. New Jersey: Princeton University Press.  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Theory%20of%20games%20and%20economic%20behavior&author=J.%20Neumann&author=O.%20Morgenstern&publication_year=1953) ([http://scholar.google.com/scholar\\_lookup?title=Theory%20of%20games%20and%20economic%20behavior&author=J.%20Neumann&author=O.%20Morgenstern&publication\\_year=1953](http://scholar.google.com/scholar_lookup?title=Theory%20of%20games%20and%20economic%20behavior&author=J.%20Neumann&author=O.%20Morgenstern&publication_year=1953))
- Ortega y Gasset, J. (2002). *Misión de la Universidad*. Madrid: Alianza Editorial S.A.  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Misi%C3%B3n%20de%20la%20Universidad&author=J.%20Ortega%20y%20Gasset&publication_year=2002) ([http://scholar.google.com/scholar\\_lookup?title=Misi%C3%B3n%20de%20la%20Universidad&author=J.%20Ortega%20y%20Gasset&publication\\_year=2002](http://scholar.google.com/scholar_lookup?title=Misi%C3%B3n%20de%20la%20Universidad&author=J.%20Ortega%20y%20Gasset&publication_year=2002))
- Planck, M. (2000). *Autobiografía Científica y Últimos Escritos*, Madrid, Nivola Libros y Ediciones S.L.  
[Google Scholar](https://scholar.google.com/scholar?q=Planck.%20M.%20%282000%29.%20Autobiograf%C3%ADa%20Cient%C3%ADfica%20y%20%20%28%29%20Escritos%2C%20Madrid%2C%20Nivola%20Libros%20y%20Ediciones%20S.L.) (<https://scholar.google.com/scholar?q=Planck.%20M.%20%282000%29.%20Autobiograf%C3%ADa%20Cient%C3%ADfica%20y%20%20%28%29%20Escritos%2C%20Madrid%2C%20Nivola%20Libros%20y%20Ediciones%20S.L.>)
- Poincaré, H. (1958). *The value of science*. New York: Dover Publications.  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20value%20of%20science&author=H.%20Poincar%C3%A9&publication_year=1958) ([http://scholar.google.com/scholar\\_lookup?title=The%20value%20of%20science&author=H.%20Poincar%C3%A9&publication\\_year=1958](http://scholar.google.com/scholar_lookup?title=The%20value%20of%20science&author=H.%20Poincar%C3%A9&publication_year=1958))
- Popper, K. R. (1959). *The logic of scientific discovery*. London: Hutchinson.  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20logic%20of%20scientific%20discovery&author=KR.%20Popper&publication_year=1959) ([http://scholar.google.com/scholar\\_lookup?title=The%20logic%20of%20scientific%20discovery&author=KR.%20Popper&publication\\_year=1959](http://scholar.google.com/scholar_lookup?title=The%20logic%20of%20scientific%20discovery&author=KR.%20Popper&publication_year=1959))
- Real Academia Española de la Lengua (RAE). (2001). *Diccionario de la Real Academia Española*, Madrid, Espasa-Calpe S.A.  
[Google Scholar](https://scholar.google.com/scholar?q=Real%20Academia%20Espa%C3%B1ola%20de%20la%20Lengua%20%28RAE%29.%20%282001%29.%20Diccionario%20de%20la%20Real%20Academia%20Espa%C3%B1ola%2C%20Madrid%2C%20Espasa-Calpe%20S.A.) (<https://scholar.google.com/scholar?q=Real%20Academia%20Espa%C3%B1ola%20de%20la%20Lengua%20%28RAE%29.%20%282001%29.%20Diccionario%20de%20la%20Real%20Academia%20Espa%C3%B1ola%2C%20Madrid%2C%20Espasa-Calpe%20S.A.>)
- Schank, R. (1995). Information is surprises. In J. Brockman (Ed.), *The third culture: Beyond the scientific revolution*. New York: Simon & Schuster, cop.  
[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>)

/scholar\_lookup?title=Information%20is%20surprises&author=R.%20Schank&publication\_year=1995)

Simon, H. A. (1945). *Administrative behavior: A study of decision-making processes in administrative organization*. New York: Free Press.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

/scholar\_lookup?title=Administrative%20behavior

%3A%20A%20study%20of%20decision-

[making%20processes%20in%20administrative%20organization&](http://scholar.google.com)

[author=HA.%20Simon&publication\\_year=1945\)](http://scholar.google.com)

Simon, H. A. (1962). The architecture of complexity. *Proceedings of the American Philosophical Society*, 106, 467–482.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

/scholar\_lookup?title=The%20architecture%20of%20complexity&

[author=HA.%20Simon&](http://scholar.google.com)

[journal=Proceedings%20of%20the%20American%20Philosophical%20Society&](http://scholar.google.com)  
[volume=106&pages=467-482&publication\\_year=1962\)](http://scholar.google.com)

Simon, H. A. (1981). *The sciences of the artificial*. Massachusetts: MIT Press.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

/scholar\_lookup?title=The%20sciences%20of%20the%20artificial&

[author=HA.%20Simon&publication\\_year=1981\)](http://scholar.google.com)

Simon, H. A. (1982). *Models of bounded rationality*. Massachusetts: MIT Press.

[Google Scholar](http://scholar.google.com) (<http://scholar.google.com>

/scholar\_lookup?title=Models%20of%20bounded%20rationality&

[author=HA.%20Simon&publication\\_year=1982\)](http://scholar.google.com)

Soriano, F. J. (2003). *Modelo de Arquitectura para Gestión Cooperativa de Sistemas y Servicios Distribuidos Basado en Agentes Autónomos*, Ph.D.

Dissertation, Technical University of Madrid.

[Google Scholar](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20Modelo%20de%20Arquitectura%20para%20Gesti%C3%B3n%20Cooperativa%20de%20Sistemas%20y%20Servicios%20Distribuidos%20Basado%20en%20Agentes%20Aut%C3%B3nomos%20Ph.D.%20Dissertation%20Technical%20University%20of%20Madrid.) (<https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20Modelo%20de%20Arquitectura%20para%20Gesti%C3%B3n%20Cooperativa%20de%20Sistemas%20y%20Servicios%20Distribuidos%20Basado%20en%20Agentes%20Aut%C3%B3nomos%20Ph.D.%20Dissertation%20Technical%20University%20of%20Madrid.>

[%20%282003%29.%20Modelo%20de%20Arquitectura%20para%20Gesti%C3%B3n%20Cooperativa%20de%20Sistemas%20y%20Servicios%20Distribuidos%20Basado%20en%20Agentes%20Aut%C3%B3nomos%20Ph.D.%20Dissertation%20Technical%20University%20of%20Madrid.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20Modelo%20de%20Arquitectura%20para%20Gesti%C3%B3n%20Cooperativa%20de%20Sistemas%20y%20Servicios%20Distribuidos%20Basado%20en%20Agentes%20Aut%C3%B3nomos%20Ph.D.%20Dissertation%20Technical%20University%20of%20Madrid.)

[s%20Basado%20en%20Agentes%20Aut%C3%B3nomos%20Ph.D.%20Dissertation%20Technical%20University%20of%20Madrid.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20Modelo%20de%20Arquitectura%20para%20Gesti%C3%B3n%20Cooperativa%20de%20Sistemas%20y%20Servicios%20Distribuidos%20Basado%20en%20Agentes%20Aut%C3%B3nomos%20Ph.D.%20Dissertation%20Technical%20University%20of%20Madrid.)

[%20%282003%29.%20Modelo%20de%20Arquitectura%20para%20Gesti%C3%B3n%20Cooperativa%20de%20Sistemas%20y%20Servicios%20Distribuidos%20Basado%20en%20Agentes%20Aut%C3%B3nomos%20Ph.D.%20Dissertation%20Technical%20University%20of%20Madrid.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20Modelo%20de%20Arquitectura%20para%20Gesti%C3%B3n%20Cooperativa%20de%20Sistemas%20y%20Servicios%20Distribuidos%20Basado%20en%20Agentes%20Aut%C3%B3nomos%20Ph.D.%20Dissertation%20Technical%20University%20of%20Madrid.)

[%20%282003%29.%20Modelo%20de%20Arquitectura%20para%20Gesti%C3%B3n%20Cooperativa%20de%20Sistemas%20y%20Servicios%20Distribuidos%20Basado%20en%20Agentes%20Aut%C3%B3nomos%20Ph.D.%20Dissertation%20Technical%20University%20of%20Madrid.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20Modelo%20de%20Arquitectura%20para%20Gesti%C3%B3n%20Cooperativa%20de%20Sistemas%20y%20Servicios%20Distribuidos%20Basado%20en%20Agentes%20Aut%C3%B3nomos%20Ph.D.%20Dissertation%20Technical%20University%20of%20Madrid.)

Soriano, F. J., Alonso, F., & López, G. (2002). Social commitment policies for formally specifying the organisation and behaviour of open agent societies. In *Proceedings of the 3rd international symposium on multi-agent systems, large complex systems and e-businesses (MALCEB)*, Germany (pp. 494–507).

[Google Scholar](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.) (<https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.>

[%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.)

[%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.)

[%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.)

[%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.)

[%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.)

[%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.)

[%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.)

[%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.)

[%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282002%29.%20Social%20commitment%20policies%20for%20formally%20specifying%20the%20organisation%20and%20behaviour%20of%20open%20agent%20societies.%20In%20Proceedings%20of%20the%203rd%20international%20symposium%20on%20multi-agent%20systems%20large%20complex%20systems%20and%20e-businesses%20%28MALCEB%29%20Germany%20%28pp.%20494%E2%80%93507%29.)

Soriano, F. J., Alonso, F., & López, G. (2003). A formal specification language for agent conversations. In V. Maik, J. Müller, & M. Pchouek (Eds.) *3rd international central and Eastern European conference on multi-agent systems multi-agent systems and applications III*, LNCS, (Vol. 2691, pp. 214–225). Berlin: Springer.

[Google Scholar](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20A%20formal%20specification%20language%20for%20agent%20conversations.%20In%20V.%20Maik%2C%20J.%20M%C3%BCller%2C%20M.%20Pchouek%20Eds.%203rd%20international%20central%20and%20Eastern%20European%20conference%20on%20multi-agent%20systems%20multi-agent%20systems%20and%20applications%20III%2C%20LNCS%2C%20Vol.%202691%2C%20pp.%20214%E2%80%93225%29.%20Berlin%20Springer.) (<https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20A%20formal%20specification%20language%20for%20agent%20conversations.%20In%20V.%20Maik%2C%20J.%20M%C3%BCller%2C%20M.%20Pchouek%20Eds.%203rd%20international%20central%20and%20Eastern%20European%20conference%20on%20multi-agent%20systems%20multi-agent%20systems%20and%20applications%20III%2C%20LNCS%2C%20Vol.%202691%2C%20pp.%20214%E2%80%93225%29.%20Berlin%20Springer.>

[%20%282003%29.%20A%20formal%20specification%20language%20for%20agent%20conversations.%20In%20V.%20Maik%2C%20J.%20M%C3%BCller%2C%20M.%20Pchouek%20Eds.%203rd%20international%20central%20and%20Eastern%20European%20conference%20on%20multi-agent%20systems%20multi-agent%20systems%20and%20applications%20III%2C%20LNCS%2C%20Vol.%202691%2C%20pp.%20214%E2%80%93225%29.%20Berlin%20Springer.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20A%20formal%20specification%20language%20for%20agent%20conversations.%20In%20V.%20Maik%2C%20J.%20M%C3%BCller%2C%20M.%20Pchouek%20Eds.%203rd%20international%20central%20and%20Eastern%20European%20conference%20on%20multi-agent%20systems%20multi-agent%20systems%20and%20applications%20III%2C%20LNCS%2C%20Vol.%202691%2C%20pp.%20214%E2%80%93225%29.%20Berlin%20Springer.)

[%20%282003%29.%20A%20formal%20specification%20language%20for%20agent%20conversations.%20In%20V.%20Maik%2C%20J.%20M%C3%BCller%2C%20M.%20Pchouek%20Eds.%203rd%20international%20central%20and%20Eastern%20European%20conference%20on%20multi-agent%20systems%20multi-agent%20systems%20and%20applications%20III%2C%20LNCS%2C%20Vol.%202691%2C%20pp.%20214%E2%80%93225%29.%20Berlin%20Springer.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20A%20formal%20specification%20language%20for%20agent%20conversations.%20In%20V.%20Maik%2C%20J.%20M%C3%BCller%2C%20M.%20Pchouek%20Eds.%203rd%20international%20central%20and%20Eastern%20European%20conference%20on%20multi-agent%20systems%20multi-agent%20systems%20and%20applications%20III%2C%20LNCS%2C%20Vol.%202691%2C%20pp.%20214%E2%80%93225%29.%20Berlin%20Springer.)

[%20%282003%29.%20A%20formal%20specification%20language%20for%20agent%20conversations.%20In%20V.%20Maik%2C%20J.%20M%C3%BCller%2C%20M.%20Pchouek%20Eds.%203rd%20international%20central%20and%20Eastern%20European%20conference%20on%20multi-agent%20systems%20multi-agent%20systems%20and%20applications%20III%2C%20LNCS%2C%20Vol.%202691%2C%20pp.%20214%E2%80%93225%29.%20Berlin%20Springer.](https://scholar.google.com/scholar?q=Soriano%2C%20F.%20J.%20%282003%29.%20A%20formal%20specification%20language%20for%20agent%20conversations.%20In%20V.%20Maik%2C%20J.%20M%C3%BCller%2C%20M.%20Pchouek%20Eds.%203rd%20international%20central%20and%20Eastern%20European%20conference%20on%20multi-agent%20systems%20multi-agent%20systems%20and%20applications%20III%2C%20LNCS%2C%20Vol.%202691%2C%20pp.%20214%E2%80%93225%29.%20Berlin%20Springer.)

%20%282003%29.%20A%20formal%20specification%20language%20for%20agent%20conversations.%20In%20V.%20Maik%2C%20J.%20M%2C%20BCller%2C%20%26%20M.%20Pchouek%20%28Eds.%29%203rd%20international%20central%20and%20Eastern%20European%20conference%20on%20multi-agent%20systems%20multi-agent%20systems%20and%20applications%20III%2C%20LNCS%2C%20%28Vol.%202691%2C%20pp.%20214E2%80%93225%29.%20Berlin%20%3A%20Springer.)

Szpiro, G. (2003). Does the proof stack up? *Nature*, 424, 12–13.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Does%20the%20proof%20stack%20up%3F&author=G.%20Szpiro&journal=Nature&volume=424&pages=12-13&publication_year=2003) ([http://scholar.google.com/scholar\\_lookup?title=Does%20the%20proof%20stack%20up%3F&author=G.%20Szpiro&journal=Nature&volume=424&pages=12-13&publication\\_year=2003](http://scholar.google.com/scholar_lookup?title=Does%20the%20proof%20stack%20up%3F&author=G.%20Szpiro&journal=Nature&volume=424&pages=12-13&publication_year=2003))

Tarski, A. (1956). *Logic, semantics, metamathematics*. Oxford: Clarendon Press.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Logic%2C%20semantics%2C%20metamathematics&author=A.%20Tarski&publication_year=1956) ([http://scholar.google.com/scholar\\_lookup?title=Logic%2C%20semantics%2C%20metamathematics&author=A.%20Tarski&publication\\_year=1956](http://scholar.google.com/scholar_lookup?title=Logic%2C%20semantics%2C%20metamathematics&author=A.%20Tarski&publication_year=1956))

Taylor, R., & Wiles, A. (1995). Ring-theoretic properties of certain Hecke algebras. *Annals of Mathematics*, 141(3), 553–572.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Ring-theoretic%20properties%20of%20certain%20Hecke%20algebras&author=R.%20Taylor&author=A.%20Wiles&journal=Annals%20of%20Mathematics&volume=141&issue=3&pages=553-572&publication_year=1995) ([http://scholar.google.com/scholar\\_lookup?title=Ring-theoretic%20properties%20of%20certain%20Hecke%20algebras&author=R.%20Taylor&author=A.%20Wiles&journal=Annals%20of%20Mathematics&volume=141&issue=3&pages=553-572&publication\\_year=1995](http://scholar.google.com/scholar_lookup?title=Ring-theoretic%20properties%20of%20certain%20Hecke%20algebras&author=R.%20Taylor&author=A.%20Wiles&journal=Annals%20of%20Mathematics&volume=141&issue=3&pages=553-572&publication_year=1995))

Thagard, P. (1978). The best explanation: Criteria for theory choice. *Journal of Philosophy*, 75, 76–92.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20best%20explanation%3A%20Criteria%20for%20theory%20choice&author=P.%20Thagard&journal=Journal%20of%20Philosophy&volume=75&pages=76-92&publication_year=1978) ([http://scholar.google.com/scholar\\_lookup?title=The%20best%20explanation%3A%20Criteria%20for%20theory%20choice&author=P.%20Thagard&journal=Journal%20of%20Philosophy&volume=75&pages=76-92&publication\\_year=1978](http://scholar.google.com/scholar_lookup?title=The%20best%20explanation%3A%20Criteria%20for%20theory%20choice&author=P.%20Thagard&journal=Journal%20of%20Philosophy&volume=75&pages=76-92&publication_year=1978))

Uttley, A. M. (1970). The informon: A network for adaptive pattern recognition. *Journal of Theoretical Biology*, 27, 31–67.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20informon%3A%20A%20network%20for%20adaptive%20pattern%20recognition&author=AM.%20Uttley&journal=Journal%20of%20Theoretical%20Biology&volume=27&pages=31-67&publication_year=1970) ([http://scholar.google.com/scholar\\_lookup?title=The%20informon%3A%20A%20network%20for%20adaptive%20pattern%20recognition&author=AM.%20Uttley&journal=Journal%20of%20Theoretical%20Biology&volume=27&pages=31-67&publication\\_year=1970](http://scholar.google.com/scholar_lookup?title=The%20informon%3A%20A%20network%20for%20adaptive%20pattern%20recognition&author=AM.%20Uttley&journal=Journal%20of%20Theoretical%20Biology&volume=27&pages=31-67&publication_year=1970))

van Heijst, G., van der Spek, R., & Kruizinga, E. (1998). The lessons learned cycle. In U. M. Borghoff & R. Pareschi (Eds.), *Information technology for knowledge management* (pp. 17–34). Springer: Berlin.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20lessons%20learned%20cycle&author=G.%20Heijst&author=R.%20Spek&author=E.%20Kruizinga&pages=17-34&publication_year=1998) ([http://scholar.google.com/scholar\\_lookup?title=The%20lessons%20learned%20cycle&author=G.%20Heijst&author=R.%20Spek&author=E.%20Kruizinga&pages=17-34&publication\\_year=1998](http://scholar.google.com/scholar_lookup?title=The%20lessons%20learned%20cycle&author=G.%20Heijst&author=R.%20Spek&author=E.%20Kruizinga&pages=17-34&publication_year=1998))

Weber, R., Aha, D. W., & Becerra-Fernández, I. (2001). Intelligent lessons learned systems. *Expert Systems with Applications*, 20(1), 17–34.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Intelligent%20lessons%20learned%20systems&author=R.%20Weber&author=DW.%20Aha&author=I.%20Becerra-Fern%C3%A1ndez&journal=Expert%20Systems%20with%20Applications&volume=20&) ([http://scholar.google.com/scholar\\_lookup?title=Intelligent%20lessons%20learned%20systems&author=R.%20Weber&author=DW.%20Aha&author=I.%20Becerra-Fern%C3%A1ndez&journal=Expert%20Systems%20with%20Applications&volume=20&](http://scholar.google.com/scholar_lookup?title=Intelligent%20lessons%20learned%20systems&author=R.%20Weber&author=DW.%20Aha&author=I.%20Becerra-Fern%C3%A1ndez&journal=Expert%20Systems%20with%20Applications&volume=20&))

issue=1&pages=17-34&publication\_year=2001)

Weinberg, S. (2001). *Facing up: Science and its cultural adversaries*. Massachusetts: Harvard University Press.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Facing%20up%3A%20Science%20and%20its%20cultural%20adversaries&author=S.%20Weinberg&publication_year=2001) ([http://scholar.google.com/scholar\\_lookup?title=Facing%20up%3A%20Science%20and%20its%20cultural%20adversaries&author=S.%20Weinberg&publication\\_year=2001](http://scholar.google.com/scholar_lookup?title=Facing%20up%3A%20Science%20and%20its%20cultural%20adversaries&author=S.%20Weinberg&publication_year=2001))

Westerinen, A. (2003). What is policy? and, What can it be? In *Keynote in proceedings of the IEEE policy 2003 conference*, Lake Como.

[Google Scholar](https://scholar.google.com/scholar?q=Westerinen%2C%20A.%20%282003%29.%20What%20is%20policy%3F%20and%2C%20What%20can%20it%20be%3F%20In%20Keynote%20in%20proceedings%20of%20the%20IEEE%20policy%202003%20conference%2C%20Lake%20Como.) (<https://scholar.google.com/scholar?q=Westerinen%2C%20A.%20%282003%29.%20What%20is%20policy%3F%20and%2C%20What%20can%20it%20be%3F%20In%20Keynote%20in%20proceedings%20of%20the%20IEEE%20policy%202003%20conference%2C%20Lake%20Como.>)

Wilber, K. (1995). *Sex, ecology and spirituality: The evolution of spirit*. New York: Shambhala.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Sex%2C%20ecology%20and%20spirituality%3A%20The%20evolution%20of%20spirit&author=K.%20Wilber&publication_year=1995) ([http://scholar.google.com/scholar\\_lookup?title=Sex%2C%20ecology%20and%20spirituality%3A%20The%20evolution%20of%20spirit&author=K.%20Wilber&publication\\_year=1995](http://scholar.google.com/scholar_lookup?title=Sex%2C%20ecology%20and%20spirituality%3A%20The%20evolution%20of%20spirit&author=K.%20Wilber&publication_year=1995))

Wilber, K. (1996). *A brief history of everything*. Boston: Shambhala.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=A%20brief%20history%20of%20everything&author=K.%20Wilber&publication_year=1996) ([http://scholar.google.com/scholar\\_lookup?title=A%20brief%20history%20of%20everything&author=K.%20Wilber&publication\\_year=1996](http://scholar.google.com/scholar_lookup?title=A%20brief%20history%20of%20everything&author=K.%20Wilber&publication_year=1996))

Wiles, A. (1995). Modular elliptic curves and Fermat's last theorem. *Annals of Mathematics*, 141, 443–551.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Modular%20elliptic%20curves%20and%20Fermat%20%E2%80%99s%20last%20theorem&author=A.%20Wiles&journal=Annals%20of%20Mathematics&volume=141&pages=443-551&publication_year=1995) ([http://scholar.google.com/scholar\\_lookup?title=Modular%20elliptic%20curves%20and%20Fermat%20%E2%80%99s%20last%20theorem&author=A.%20Wiles&journal=Annals%20of%20Mathematics&volume=141&pages=443-551&publication\\_year=1995](http://scholar.google.com/scholar_lookup?title=Modular%20elliptic%20curves%20and%20Fermat%20%E2%80%99s%20last%20theorem&author=A.%20Wiles&journal=Annals%20of%20Mathematics&volume=141&pages=443-551&publication_year=1995))

Wood, M. F., & DeLoach, S. A. (2001). An overview of the multiagent systems engineering methodology. In P. Ciancarini, & M. J. Wooldridge (Eds.) *First international workshop AOSE 2000 on agent-oriented software engineering*, LNAI, (Vol. 1957, pp. 207–222). Berlin: Springer.

[Google Scholar](https://scholar.google.com/scholar?q=Wood%2C%20M.%20F.%2C%20%26%20DeLoach%2C%20S.%20A.%20%282001%29.%20An%20overview%20of%20the%20multiagent%20systems%20engineering%20methodology.%20In%20P.%20Ciancarini%2C%20%26%20M.%20J.%20Wooldridge%20%28Eds.%29%20First%20international%20workshop%20AOSE%202000%20on%20agent-oriented%20software%20engineering%2C%20LNAI%2C%20%28Vol.%201957%2C%20pp.%20207%E2%80%93222%29.%20Berlin%3A%20Springer.) (<https://scholar.google.com/scholar?q=Wood%2C%20M.%20F.%2C%20%26%20DeLoach%2C%20S.%20A.%20%282001%29.%20An%20overview%20of%20the%20multiagent%20systems%20engineering%20methodology.%20In%20P.%20Ciancarini%2C%20%26%20M.%20J.%20Wooldridge%20%28Eds.%29%20First%20international%20workshop%20AOSE%202000%20on%20agent-oriented%20software%20engineering%2C%20LNAI%2C%20%28Vol.%201957%2C%20pp.%20207%E2%80%93222%29.%20Berlin%3A%20Springer.>)

Yemini, Y. (1993). The OSI network management model. *IEEE Communication Magazine*, 31(5), 20–29.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20OSI%20network%20management%20model&author=Y.%20Yemini&journal=IEEE%20Communication%20Magazine&volume=31&issue=5&pages=20-29&publication_year=1993) ([http://scholar.google.com/scholar\\_lookup?title=The%20OSI%20network%20management%20model&author=Y.%20Yemini&journal=IEEE%20Communication%20Magazine&volume=31&issue=5&pages=20-29&publication\\_year=1993](http://scholar.google.com/scholar_lookup?title=The%20OSI%20network%20management%20model&author=Y.%20Yemini&journal=IEEE%20Communication%20Magazine&volume=31&issue=5&pages=20-29&publication_year=1993))

Zambonelli, F., Jennings, N. R., & Wooldridge, M. (2003). Developing multiagent systems: The Gaia methodology. *ACM Transactions on Software Engineering and Methodology*, 12(3), 317–370.

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Developing%20multiagent%20systems%3A%20The%20Gaia%20methodology&author=F.%20Zambonelli&author=NR.%20Jennings&author=M.%20Wooldridge&journal=ACM%20Transactions%20on%20Software%20Engineering%20and%20Methodology&volume=12&issue=3&pages=317-370&publication_year=2003) ([http://scholar.google.com/scholar\\_lookup?title=Developing%20multiagent%20systems%3A%20The%20Gaia%20methodology&author=F.%20Zambonelli&author=NR.%20Jennings&author=M.%20Wooldridge&journal=ACM%20Transactions%20on%20Software%20Engineering%20and%20Methodology&volume=12&issue=3&pages=317-370&publication\\_year=2003](http://scholar.google.com/scholar_lookup?title=Developing%20multiagent%20systems%3A%20The%20Gaia%20methodology&author=F.%20Zambonelli&author=NR.%20Jennings&author=M.%20Wooldridge&journal=ACM%20Transactions%20on%20Software%20Engineering%20and%20Methodology&volume=12&issue=3&pages=317-370&publication_year=2003))

---

## Copyright information

© Springer Nature B.V. 2019

---

### About this article

#### Cite this article as:

de la Peña, F.D., Lara, J.A., Lizcano, D. et al. Found Sci (2019). <https://doi.org/10.1007/s10699-019-09597-5>

#### First Online

23 February 2019

#### DOI

<https://doi.org/10.1007/s10699-019-09597-5>

#### Publisher Name

Springer Netherlands

#### Print ISSN

1233-1821

#### Online ISSN

1572-8471

[About this journal](#)

[Reprints and Permissions](#)

---

### Personalised recommendations

1. [A Privacy-Preserving Trust Model Based on Blockchain for VANETs](#)  
Lu, Zhaojun... Liu, Zhenglin  
*IEEE Access* (2018)
2. [A new approach to computing using informons and holons](#)  
de la Peña Esteban, F. David... Sierra, Juan Pazos  
*Proceedings of the First International Conference on Data Science, E-learning and Information Systems - DATA '18* (2018)
3. [A Blockchain Based Decentralized Platform for Ubiquitous Learning Environment](#)  
Bdiwi, Rawia... Cherif, Arab Ali  
*2018 IEEE 18th International Conference on Advanced Learning Technologies (ICALT)* (2018)

Want recommendations via email? [Sign up now](#)

Powered by: **Recommended** 

**SPRINGER NATURE**

© 2018 Springer Nature Switzerland AG. Part of [Springer Nature](#).

Not logged in · Not affiliated · 88.19.8.226