RENATO MANGANO[1]

IMPROVING COOPERATION IN CROSS-BORDER INSOLVENCY ISSUES BY MEANS OF BLOCKCHAIN TECHNOLOGY[2]

Abstract

In cross-border cases cooperation is crucial, and regulators have been producing a great deal of legal instruments aiming at either imposing or recommending it. But, despite these efforts, cooperation remains fragile, especially in those countries where courts and insolvency practitioners tend to over-protect local interests. To tackle these shortcomings, this paper will suggest a two-step solution with the help of game theory. This proposal will consist, firstly, in a paradigm shift according to which regulators ought to get over the individualistic approach of the 'command and control regulation' and encourage forms of governance which build trust and a sense of reciprocity; secondly, in networking 'players' in insolvency proceedings by means of blockchain technology. Arguably, this technology can enable a form of governance which is inclusive, transparent and secure. The network is truly decentralized. Each participant has a full copy of the ledger and, accordingly, all information concerning the case. The paper will end with some proposals for better regulation and the wish that the UNCITRAL will facilitate teamwork between legal scholars and IT-experts in order to increasingly extract value from blockchain technology.

Text

1. What is cooperation and how does it work?

Law requires cooperation. As regards domestic law, this is a common opinion maintained by those scholars who point out that the presence of a state is not sufficient

---

[1] Renato Mangano is a Professor of Commercial Law at the University of Palermo (Italy). He is also a member of the Academic Forum of INSOL–Europe (renato.mangano@unipa.it; 00393356673809).

[2] Sometimes this paper refers to homepages and other Internet resources. When this is the case, these resources are assumed to have been retrieved on 28th November 2016 last.

to ground the effectiveness of legal prescriptions;[3] by contrast, as regards cross-border cases, this is a necessity. In fact, academics, judges and practitioners dealing with cross-border cases state that cooperation bridges the gap existing between the fact that hard-law prescriptions are national in nature and the fact that their application might be supranational in scope.[4] This statement applies to cross-border insolvency law too. Actually, here scholars and practitioners state that – ideally – the court of that state to which the debtor has his strongest connection should have jurisdiction to open one set of insolvency proceedings only, and that this court, the insolvency practitioner appointed there and the law of that state should have control over the whole case (universalism).[5] Nevertheless, even the strongest advocates for universalism, maintain that – concretely – universalism pure does not exist anywhere and that this approach is usually combined with another one whereby each state administers assets within its territory and recognizes that other countries do the same (territorialism).[6] The result is a form of mitigated, or cooperative, universalism according to which there is one debtor, but many insolvency proceedings, many courts, many practitioners and, very often, many applicable laws.[7] This situation is even exacerbated where insolvency concerns companies belonging to a multinational group—here, there are also many debtors.[8]

International bodies and standard setters are aware of this gap and, for this reason, they are continually engaged in a lawmaking process suggesting cooperation between courts and practitioners dealing with the same case but belonging to different jurisdictions.

---

[3] See, among the many others: Ellicksons, *Order Without Law: How Neighbors Settle Disputes*, Harvard University Press, 1991; Posner (E.A.), *Law and Social Norms*, Harvard University Press, 2000, and Prodi, *Una storia della giustizia. Dal pluralismo dei fori al moderno dualismo tra coscienza e diritto*, Il Mulino, 2000. This book was translated into German by Annette Seemann (*Eine Geschichte der Gerechtigkeit. Vom Recht Gottes zum modernen Rechtsstaat*, 2nd ed., Beck, 2005).

[4] Actually, international private law prescriptions aim at bridging this gap. However, they are national too; moreover, they follow different patterns state-by-state. So Fletcher, *Insolvency in Private International Law*, 2nd ed., OUP, 2005, 7, s. 1.06. In this respect, see further Yntema, 'The Historic Bases of Private International Law', *1953 The American Journal of Comparative Law*, 297 ff.; and, as regards cooperation between judges, Slaughter, 'A Global Community of Courts', *2003 Harvard International Law Journal*, 191 ff.

[5] Wessels/Markell/Kilborn, *International Cooperation in Bankruptcy and Insolvency Matters*, OUP, 2009, 39 ff.

[6] Westbrook, 'Universal Priorities', *1998 Tex. Int'l L.J.*, 43, and Trautman-Westbrook-Gaillard, 'Four Models for International Bankruptcy', *1993 Amer. Journ. Comp. Law*, 582 ff.

[7] Wessels/Markell/Kilborn, *International Cooperation,* cit., 67 ff. However, in this respect the major advocate for territorialism employs the expression 'cooperative territorialism'. See LoPucki, 'Cooperation in International Bankruptcy: A Post-Universalist Approach', *1999 Cornell L.R.*, 647, text and fn. 266. On this point, see also Fletcher, *Insolvency in Private International Law*, cit., 15, s. 1.16, who prefers to adopt a more pragmatic approach; to avoid the rigid universalism-territorialism dichotomy and the urge for its 'modification'; and to speak of the existence of an 'Internationalist Principle'.

[8] Mevorach, *Insolvency within Multinational Enterprise Groups*, OUP, 2009, 62 ff.

UNCITRAL is a case in point. However, international bodies and standard setters are equally aware that cooperation is still an open issue. This explains why the UNIDROIT 'Convention on international interests in mobile equipment' (Cape Town Convention) does not establish a duty to cooperate in insolvency issues and why the Protocols attached to this Convention consign the only prescription devoted to this subject to the class of opt-in prescriptions, with the result that a state signing that Convention which also intends to be subject to the duty of cooperation (insolvency assistance) is required to make an express relevant declaration.[9]

But why is cooperation so tricky? The reasons why courts and insolvency practitioners have difficulties in cooperating with each other may be many. Sometimes, these shortcomings depend on difficulties in communicating in a foreign language; sometimes, they depend on a lack of trust; sometimes, they depend on uncertainty in legal framework; sometimes they depend on some other factors which are specific to that context where courts and insolvency practitioners are required to cooperate. Whatever the reason why they do not cooperate, there is evidence that courts and/or practitioners dealing with the same case but belonging to different jurisdictions raise a problem of collective action and that they have incentives not to cooperate even if it appears that it is in their best interests to do so.

The game theory may prove a useful tool to explain this dynamic, which reproduces that of the so-called 'prisoner's dilemma'. For the sake of simplicity, consider a cross-border case where $Court_A$ and $Court_B$ are required to cooperate. Both $Court_A$ and $Court_B$ have two choices, namely either to cooperate or not to cooperate. Each court must make a choice depending on the other court's possible choice, but without knowing what the other court will really do. This is the dilemma. Figure 1 illustrates this dynamic. $Court_A$ chooses a row, in order to decide whether to cooperate or not. $Court_B$ chooses a column, in order to decide whether to cooperate or not. The outcomes of the game are expressed in term of payoffs. They range from 1 to 5 points. These points conventionally quantify how court behaviours are individually efficient, in terms both of quickness of local proceedings and protection of local interests. The sum of those payoffs referred to in a single cell expresses how court behaviours are efficient for the cross-border case as whole.

---

[9] UNIDROIT Convention on International Interests in Mobile Equipment (2001). This is available to download at: http://www.unidroit.org/instruments/security-interests/cape-town-convention. This regulation is supplemented by three protocols which refer to 'aircraft equipment', 'railway rolling stocks' and 'space assets', respectively. The opt-in prescriptions concerning cooperation (Insolvency assistance) are laid down by Art. XII of the 'Protocol on Aircraft equipment'; Art. X of the 'Protocol on Railway rolling stocks'; and Art. XXII of the 'Protocol on space assets'. These Protocols are available at the following addresses respectively: http://www.unidroit.org/instruments/security-interests/aircraft-protocol; http://www.unidroit.org/ instruments/ security-interests/ rail-protocol; http://www.unidroit.org/ instruments/ security-interests/space-protocol.

Suppose that Court$_A$ thinks that Court$_B$ will cooperate. Court$_A$ has two choices, namely either to cooperate or not to cooperate. Here, the first column of figure 1 features the two possible outcomes. If Court$_A$ cooperates, it will receive a payoff of 3 points—here, Court$_B$ will receive 3 points too. By contrast, if Court$_A$ does not cooperate, it will receive a payoff of 5 points, while Court$_B$ will receive 0 points. Now, suppose that Court$_A$ thinks that Court$_B$ will not cooperate. Again Court$_A$ has two choices, namely either to cooperate or not to cooperate. Here, the second column of figure 1 features the two possible outcomes. If Court$_A$ cooperates, it receives a payoff of 0 points, while Court$_B$ will receive 5 points. By contrast, if Court$_A$ does not cooperate, it will receive a payoff of 1 point—here, Court$_B$ will receive 1 point too.

This means that, no matter what Court$_B$ does, Court$_A$ will receive higher payoffs by not cooperating than by cooperating—5 points are more than 3 points, and even more than 1 or 0 points. But this also means that, if neither Court$_A$ or Court$_B$ cooperate, both do worse than if both had cooperated (1 point is less than 3 points). Similarly, this logic holds for Court$_B$. Further, this modelling of strategic interaction between courts means that, if Court$_A$ continues to interact with Court$_B$ – as happens in a real cross-border insolvency case – Court$_A$ will certainly assume that Court$_B$ will not cooperate and Court$_A$ will therefore insist in its strategy of non-cooperation. Similarly, this logic will hold for Court$_B$.

<div align="center">Court$_B$</div>

		COOPERATE	NON-COOPERATE
Court$_A$	COOPERATE	Court$_A$ = 3 Court$_B$ = 3	Court$_A$ = 0 Court$_B$ = 5
	NON-COOPERATE	Court$_A$ = 5 Court$_B$ = 0	Court$_A$ = 1 Court$_B$ = 1

Figure 1 — Courts' strategic interaction.

2. Two strategies to improve cooperation: *regulating* cooperation and *governing* cooperation

To improve cooperation, policy makers usually employ a strategy of *regulation*. Around the world there are many examples of this kind of intervention. This may consist either in a form of 'command and control regulation' imposing a set of binding rules (hard-law), [10] or in different forms of soft-law recommendations more or less reproducing the

---

[10] See: Arts. 41-44 of EU Regulation 2015/848; paragraphs 347, 348 and 352 of the German Insolvency Code; and Spanish *Ley 29/2015, de 31 de julio de 2015, de cooperación jurídica*

contents of the command regulation but suggesting non-binding behaviours.[11] Basically, the 'command and control regulation' – which for the purpose of this paper includes any form of regulation both imposing (hard-law) or suggesting (soft-law) cooperation – is aimed at defining the situations where cooperation is required, determining the entities that have to cooperate (courts, insolvency practitioners, court intermediaries, etc.), and imposing duties of cooperation on them.[12] Lawmakers may arrange this strategy in different levels of abstraction or concreteness, respectively. For instance, policy makers either may merely establish that courts and insolvency practitioners have to cooperate, or they may also specify what this duty concretely implies and what its extension is. For this purpose, a regulation on cooperation may give examples;[13] may refer to systematic elements which – in the abstract – form a framework within which – in the concrete – courts and insolvency practitioners have to interpret and apply prescriptions imposing the duty of cooperation;[14] and/or may contain teleological elements which – in the abstract – express the purpose of cooperation, in order to require courts and insolvency practitioners to determine the means and the activities which – in the concrete – appear most appropriate.[15] The European Union and other

---

internacional–which is considered as applicable to insolvency cross-border cases by analogy only.

[11] For example, see: UNCITRAL 'Model Law on Cross-Border Insolvency' (1997), and its 'Guide to Enactment and Interpretation' (2013); UNCITRAL 'Practice Guide on Cross-Border Insolvency Cooperation' (2009); 'III/ALI Transnational Insolvency: Global Principles for Cooperation in International Insolvency Cases' (2009); INSOL 'European Communication and Cooperation Guidelines for Cross-border Insolvency ('CoCo Guidelines')' (2007); and 'EU Cross-Border Insolvency Court-to-Court Cooperation Principles and Guidelines' (2014).

[12] Baldwin/Cave/Lodge, *Understanding Regulation: Theory, Strategy, and Practice*, 2nd ed., OUP, 2012, 106 ff. Traditional taxonomies contrast 'command and control regulation' where legal authority and the command of law is used to pursue policy objectives, and 'soft-law regulation' where there are neither a regulating central state nor concepts of legal authority and command of law. This paper does not reject this taxonomy. However, it maintains that, if NGOs or other international bodies set up non-binding standards to improve cooperation in insolvency matters, they reproduce the basic idea of 'command and control regulation' that regulating is a hierarchical one-way relation running from a regulator to one or more regulatees.

[13] For example, Art. 42.3 of EU Regulation 2015/848 lays down that cooperation between courts "[…] *may, in particular, concern*: (a) coordination in the appointment of the insolvency practitioners; (b) communication of information by any means considered appropriate by the court; (c) coordination of the administration and supervision of the debtor's assets and affairs; (d) coordination of the conduct of hearings; (e) coordination in the approval of protocols, where necessary." (Italics added).

[14] For example, Art. 41.1 of EU Regulation 2015/848 lays down that "[t]he insolvency practitioner in the main insolvency proceedings and the insolvency practitioner or practitioners in secondary insolvency proceedings concerning the same debtor shall cooperate with each other *to the extent such cooperation is not incompatible with the rules applicable to the respective proceedings*." (Italics added).

[15] For example, Guideline 2.2 of 'European Communication and Cooperation Guidelines for Cross-border Insolvency ('CoCo') states: "[…] these Guidelines *aim to promote: (i) The orderly,*

European Member States provide relevant examples of binding regulation on cross-border cooperation in insolvency issues.[16] By contrast, UNCITRAL and other international bodies provide relevant examples of non-binding regulation on cooperation in cross-border insolvency issues. In this respect, the UNCITRAL 'Model Law on Cross-Border Insolvency and its Guide to Enactment and Interpretation', and the UNCITRAL 'Practice Guide on Cross-Border Insolvency Cooperation' are among the most relevant cases in point.[17] In turn, both binding and non-binding regulation may allow courts and insolvency practitioners to conclude agreements and protocols in order to make their duties of cooperation better tailored to the needs of the case.[18]

However, to improve cooperation, policy makers may employ a strategy of *governance* which, in turn, consists in influencing behaviours and in designing a framework where courts and insolvency practitioners are facilitated in cooperating, or even motivated to do so. [19] To name this form of strategy, legal theorists and experts in behavioural economics employ different labels ranging from 'nudging', 'self-regulation' (which may

---

effective, efficient and timely administration of proceedings; (ii) The identification, preservation and maximisation of the value of the debtor's assets (which includes the debtor's undertaking or business) on a world-wide basis; (iii) The sharing of information in order to reduce the costs involved; and (iv) The avoidance or minimisation of litigation, costs and inconvenience to all parties affected by proceedings." (Italics added). In this respect, see also Mangano, "The Enemies of Cooperation: from 'Prisoner's Dilemma' to Reluctance to Use Judicial Discretion", which reproduces a lecture given at the Max-Planck Institute Luxembourg for Procedural Law on 7th October 2016. This lecture, which was given within a conference devoted to 'The Implementation of the New Insolvency Regulation', will be published in 2017 in a book edited by Hess/Bariatti/Oberhammer. Mangano's paper analyses prescriptions imposing/suggesting duties on cross-border insolvency cooperation within categories of legal reasoning; maintains that these prescriptions are open-textured and that they require courts and insolvency practitioners to make a choice between alternative rulings and activities; and states that a regulator may improve cooperation reducing discretion in their application by means both of the so-called *Typus-Lehre*, and of both systematic and consequentialist helps.

[16] See footnote No 10.

[17] UNCITRAL 'Legislative Guide on Insolvency Law, Part Three: Treatment of enterprise groups in insolvency' (2010) is relevant as well. These documents are available to download at http://www.uncitral.org/uncitral/uncitral_texts/insolvency.html.

[18] For the sake of brevity, this paper does not contain a section on cases where regulation on cooperation 'delegates' courts and insolvency practitioners to regulate cooperation by means of agreements and protocols. If this is the case, the game theory framework is still valid, but another variable is required in order to express the costs of enforcement of those agreements and protocols.

[19] Of course, here the concept of 'governance' does not refer to the mere act of governing— by contrast, here it refers to a particular style of governing where a policy maker "is concerned with the *identification, explication, and mitigation of all forms of contractual hazards.*" (Italics in original). So Williamson, *The Mechanisms of Governance*, OUP, 1996, 5.

in turn be: 'pure' or 'mandated'), 'responsive regulation', and so on. [20] However, even though this universe of labels and nuances may be deceptive, the concept is clear. In fact, while the 'command and control regulation' only focuses on a one-way relation 'regulator–regulatee' and consists in imposing or suggesting duties of cooperation on regulatees, the strategy of governance is much more sophisticated. For instance, the strategy of governance focuses on interaction between the 'regulator' and the 'regulatee'—moreover, this interaction may also involve more than two entities; the strategy of governance is aimed at increasing common understanding about the benefits of cooperation, building trust and a sense of reciprocity, standardising actions and providing default choices and, all in all, at reducing costs of monitoring and enforcement.

Figure 2 contrasts *regulating* and *governing* cooperation, and in so doing, it outlines the main differences between the two strategies. Policy makers may adopt only one strategy; they may adopt both these strategies, alternatively; or they may wisely combine them, as will be suggested in the following pages.[21]

	REGULATING COOPERATION	GOVERNING COOPERATION
SOURCE	Hard law / soft law	Hard law / soft law
MEANS	Commanding and controlling behaviours	Informing and orienting choices
	Focussing on a one-way relation regulator–regulatee	Focussing on interactions between participants
	Imposing duties	Increasing a common understanding about benefits of cooperation, building trust and a sense of reciprocity
	Mandating choices	Standardising actions and providing default choices
	Enforcing duties	Stimulating peer pressure
	Sanctioning	Signalling and disclosing feedbacks
GOALS	Improving cooperation in a specific case only	Both improving cooperation in a specific case and managing cultural changes

Figure 2 — Regulating *cooperation vs* governing *cooperation.*

---

[20] For these terms, and the concepts to which they refer, see: Thaler/Sunstein, *Nudge: Improving Decisions about Health, Wealth and Happiness*, Penguin Books, 2009 (this book first appeared in 2008), 79 ff.; Baldwin/Cave/Lodge, *Understanding Regulation,* cit., 137-157 (referring to 'self-regulation'); and Ayres/Braithwaite, *Responsive Regulation: Transcending the Deregulation Debate*, OUP, 1992, 4 ff.

[21] For the use of a combination of approaches, even though in the field of environmental protection, see: Gunningham/Grabosky, *Smart Regulation – Designing Environmental Policy*, OUP, 1998, 15 ff. and 373 ff.

3. Governing cooperation by means of a peer-to-peer IT network

Figure 2 shows that the strategy of regulating cooperation and the strategy of governing cooperation essentially diverge in the methodology by which the problem is approached: while the strategy of regulating cooperation adopts an individualistic approach where courts and insolvency participants are mainly considered as duty addressees, the strategy of governing cooperation adopts a collective approach where courts and insolvency practitioners are mainly considered as group participants.

This shift in methodology raises a new question or, to be more precise, a reframed version of an old question. This question is: 'how is it possible for a policy maker to improve cooperation among group participants?'

In the past, the answer would not have been easy, because at that time experts in collective actions were quite pessimistic about the effectiveness of efforts aiming at improving cooperation among group participants.[22] But times have changed, and today scholars demonstrate with evidence of data that an appropriate use of IT can significantly improve cooperation among independent individuals belonging to the same groups, and that this operation is increasingly less costly. In this respect, writers provide many examples of 'networked cooperation'.[23] Basically, the idea of governing cooperation by means of IT consists in suggesting courts and insolvency practitioners setting up an IT network which is decentralized in nature (peer-to-peer) by means of a database system, including a database model, a database management system (DBMS) and a database; storing, organizing and managing those data which are relevant for the proceedings; combining this application with other applications which allow courts and insolvency practitioners to retrieve data and employ them to perform the operations which will be relevant case by case.[24]

Put simply, this operation requires three tasks. The first task consists in designing a conceptual data model, *i.e.* an architecture that will determine in which manner data can be stored, organized, and manipulated. This is the most crucial task whereby the database designer has to create a logical structure which thoroughly reflects the legal

---

[22] Axelrod, *The Evolution of Cooperation*, Penguin Books, 1990 (this book first appeared in 1984), 3-24; Olson (M.), *The Logic of Collective Action: Public Goods and the Theory of Groups*, Harvard University Press, 1965, reprinted in 1971, 16-22—where the author is more optimistic about cooperation in small groups; Ostrom (E.), *Governing the Commons – The Evolutions of Institutions for collective actions*, CUP, 2015 (this book first appeared in 1990), 1 ff.—where the author states that sometimes natural resources are better managed by self-regulating groups than by a central authority.

[23] Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom*, Yale University Press, 2006, 1 ff.; and, more recently, Benkler, *The Penguin and the Leviathan: How Cooperation Triumphs over Self-Interest*, Crown Business, 2011, 23.

[24] For the concept and architecture of databases, see: Elmasri/Navathe, *Fundamentals of Database Systems –Global Edition*, Pearson, 2016, 61 ff.

framework. For example, here the designer has to take into account whether the legal environment is universalistic in nature, how this universalism is arranged, how many courts and how many insolvency practitioners are involved, what is the purpose of the insolvency proceedings opened (firm liquidation or rescue), and so on. The second task consists in choosing and adopting a DBMS which is appropriate. A DBMS is computer software which will allow users to retrieve, analyse and employ data. The third task consists in collecting and storing the data which are relevant and in processing them in accordance with the goals of the proceedings.

Figures 3 and 4 show how an IT designer has to mould the network in accordance with the legal framework which is in force. In particular, Figure 3 depicts a database model which corresponds to a legal framework providing the opening of four 'independent proceedings' (cooperative universalism, basic), while figure 4 depicts a database model which corresponds to a legal framework providing the opening of one set of main insolvency proceedings which is 'dominant', and three sets of territorial proceedings which are 'dominated' (cooperative universalism, EU-style).

Figure 3—Database referring to cooperative universalism, basic. Figure 4—Database referring to cooperative universalism, EU-style.

For the sake of simplicity, figures 3 and 4 feature each jurisdiction as a node (triangle) without expanding it. However, an IT designer also has to arrange each node, and he has to build it up as a 'network in a network' where the database model is moulded in accordance with the law of that jurisdiction and the decisions taken by their courts or – if the system is IP-driven – by their insolvency practitioners. For example, figure 5 expands the node corresponding to a putative jurisdiction 'Y' by showing this as a network between a 'Court' which is territorially competent, an insolvency practitioner 'IP' who was appointed by that court, and the 'Creditors' who will lodge their claims to that set of insolvency proceedings.[25]

---

[25] This architecture might be more variegated, since it may provide some additional nodes. For instance, this architecture may provide both an additional node corresponding to an additional insolvency practitioner, and an additional node corresponding to an intermediary aiming at facilitating cooperation between courts and insolvency practitioners. By contrast, if the insolvency proceedings which were opened allow the debtor to remain totally or partially in control of his/her/its assets in accordance with a debtor-in-possession scheme (DIP), the IT
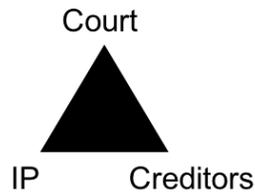
Figure 5 — Arrangement of a territorial node.

4. Not only sharing information, but governing cooperation by means of a consensus of a majority of participants. The role of blockchain technology

Now, a *caveat* is required. There are plenty of examples of peer-to-peer databases and networks. Most of them are employed for the so-called 'sharing economy'. In this respect, the Airbnb, Uber, Lyft and TaskRabbit platforms are cases in point, just to quote a few of them. Further, in the field of insolvency law the European Union has been producing an interconnection of insolvency registers of Member States—this will result in an IT platform which will be decentralized in nature.[26] Certainly, all these platforms store, organize and manage data; certainly, they share information. However, they still consider participants as users and addressees, and not as players and regulators of themselves—accordingly, they are not suited to governing cooperation.

By contrast, there is another class of peer-to-peer networks where no single party has absolute power and control, and participants play a more active role. Bitcoin, Ethereum, Ripple and Stellar and Enigma are cases in point. Satoshi Nakamoto, who was a pioneer of this technology and the designer of Bitcoin, called this technology blockchain.[27] In this

---

architecture has to contemplate a node for the debtor and, if the debtor controls his/her/its assets partially only, a node for that insolvency practitioner who controls and assists him/her/it.

[26] Arts. 24-25 of EU Regulation 2015/848. The EU Commission moreover appears to be increasingly more interested in adopting IT in insolvency matters. In this respect, see the 22.11.2016 'Proposal for a Directive of the European Parliament and of the Council on preventive restructuring frameworks, second chance and measures to increase the efficiency of restructuring, insolvency and discharge procedures and amending Directive 2012/30/EU', COM (2016) 723 final. Art. 28 of this Proposal lays down: "Member States shall ensure that the following actions may be performed electronically, including in cross-border situations: (a) filing of claims; (b) filing of restructuring or repayment plans with competent judicial or administrative authorities; (c) notifications to creditors; (d) voting on restructuring plans; (e) lodging of appeals."

[27] Satoshi Nakamoto, 'Bitcoin: A Peer-to-Peer Electronic Cash System', available to download at https://bitcoin.org/bitcoin.pdf, 1 ff. Probably, Satoshi Nakamoto is a pseudonym for a group of cryptographers. In this respect, see also Wardyński & Partners, Blockchain, Smart Contracts and DAO, 2016, available to download at http://www.codozasady.pl/wp-content/uploads/2016/11/Wardynski-and-Partners-Blockchain-smart-contracts-and-DAO.pdf.

respect, it is worth noting how the founder of Ethereum compares and contrasts Ethereum with traditional peer-to-peer networks and especially with Uber, which is an online transportation network. "Whereas most technologies tend to automate workers on the periphery doing menial task, blockhains automate away the center. Instead of putting the taxi driver out of a job, blockchains put Uber out of job and lets taxi drivers work with the customer directly."[28]

The technology which is behind Bitcoin may sound quite sophisticated, but the idea is a simple one. The network is truly decentralized. Each participant has a full copy of the ledger and, accordingly, all information concerning the case. Information is encrypted by means of a system which splits data into 'blocks' and collects them in a 'chain', while participants validate the non-opportunistic nature of each transaction by means of a consensus of half plus one of the participants (proof-of-work). Therefore, the system proves to be inclusive, transparent and secure.[29] Further, participants may sign and perform contracts and other legal transaction by using a specific protocol, which is called 'smart contract'. "A smart contract", it has been written, "is a computerized transaction protocol that executes the terms of a contract. The general objectives of smart contract design are to satisfy common contractual conditions (such as payment terms, liens, confidentiality, and even enforcement), minimize exceptions both malicious and accidental, and minimize the need for trusted intermediaries. Related economic goals include lowering fraud loss, arbitration and enforcement costs, and other transaction costs."[30]

This description specifically refers to Bitcoin, which was developed to support peer-to-peer money transferring and lending—now, this technology is expected to reshape capital markets, since it will allow savers to invest their money in financial instruments with no intervention of intermediaries.[31] However, there are other platforms, such as

---

[28] Tapscott/Tapscott, *Blockchain Revolution: How the Technology behind Bitcoin is Changing Money, Business, and the World*, Portfolio Penguin, 18, referring to the words of Vitalik Buterin, who is the founder of Ethereum.

[29] Satoshi Nakamoto, 'Bitcoin: A Peer-to-Peer Electronic Cash System', cit., 4.

[30] Tapscott/Tapscott, *Blockchain Revolution*, cit., 101-102; Peters/Panayi, Understanding Modern Banking Ledgers through Blockchain Technologies: Future of Transaction Processing and Smart Contracts on the Internet of Money, available to download at https://ssrn.com/abstract=2692487; and Bhargavan et al., 'Short Paper: Formal Verification of Smart Contracts', available to download at http://www.cs.umd.edu/~aseem/solidetherplas.pdf, 1 ff.

[31] On August 2016, the World Economic Forum in Davos issued a report that predicts that 80% of banks globally could start blockchain projects by the end of this year. This report, which is titled "The Future of Financial Infrastructure: An Ambitious Look at how Blockchain can Reshape Financial Services" is available to download at http://www3.weforum.org/docs/WEF_The_future_of_financial_infrastructure.pdf. In this respect, see also two papers which were produced by the Bank of England and which are available at the following addresses,

Ethereum, which are multipurpose in nature and which are conceived to improve additional collective actions by reducing costs of information, bargaining and enforcement.[32] For instance, Ethereum allows participants to vote at a distance; further, this could support additional applications, such as lodging claims, transferring assets, distributing assets and, more in general, any legal task which can be translated into a mathematical code. Moreover, additional projects are ongoing—these are expected to introduce both new forms of proof-of-work validating the non-opportunistic nature of each transaction, and new forms of incentives for participants which will be able to better align the selfish interest of each participant with that of the group as a whole.[33] Of course, each combination between each new form of proof-of-work and each new way of interest alignment will introduce into the system different degrees of trust and common understanding about benefits of cooperation, different forms of signalling and disclosing feedbacks, and different ways of standardising actions and stimulating peer pressure.

Again, a graph is much more communicative than many words.[34] Figure 6 illustrates the application of this mechanism to a context which is the same as in Figure 1—there are two courts, namely Court$_A$ and Court$_B$; they have two alternative choices, either to cooperate or not to cooperate; and they have incentives not to cooperate. However, here the group is arranged as a peer-to-peer IT network using blockchain technology, Bitcoin style, where both the addressees of the duties of cooperation, such as other courts, if any, and insolvency practitioners, and the beneficiaries of it, such as creditors, have an incentive to approve any decision of Court$_A$ and Court$_B$ by a majority of half plus one of the participants. The outcome is as follows: if Court$_A$ and Court$_B$ cooperate with

---

respectively:http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2014/qb14q301.pdf;   and http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2014/qb14q302.pdf.

[32] Wood, 'Ethereum: A Secure Decentralised Generalised Transaction Ledger - Eip-150 Revision', available to download at http://bravenewcoin.com/assets/Whitepapers/Ethereum-A-Secure-Decentralised-Generalised-Transaction-Ledger-Yellow-Paper.pdf, 1 ff. See also https://www.ethereum.org.

[33] In the case of Bitcoin, participants approve the interaction of strategic behaviours by a majority of half plus one of the participants. See Satoshi Nakamoto, 'Bitcoin: A Peer-to-Peer Electronic Cash System', cit., 3. But this approval may be arranged in different ways. The same flexibility exists as regards alignment between the selfish interest of each participant with that of the group as a whole. For instance, in the case of Bitcoin, participants approving non-opportunistic behaviour of the other participants in the system earn bitcoins by a process which is called 'mining'. See Satoshi Nakamoto, 'Bitcoin: A Peer-to-Peer Electronic Cash System', cit., 4. However, different forms of alignment and incentive are available.

[34] For a reason of consistency with figure 1, this graph is arranged by means of a combination between two matrices— here, the use of a game tree would have been more appropriate, probably.

each other, their behaviour will be approved; by contrast, if either Court$_A$, or Court$_B$, or both, do not cooperate, their behaviour will be not approved.

	COOPERATE	NON-COOPERATE
COOPERATE	Court$_A$ = 3 Court$_B$ = 3	Court$_A$ = 0 Court$_B$ = 5
NON-COOPERATE	Court$_A$ = 5 Court$_B$ = 0	Court$_A$ = 1 Court$_B$ = 1

⬇

APPROVAL of HALF plus ONE of the PARTICIPANTS

⬇

	COOPERATE	NON-COOPERATE
COOPERATE	Court$_A$ = 3 Court$_B$ = 3 Approved	Court$_A$ = 0 Court$_B$ = 5 Not-Approved
NON-COOPERATE	Court$_A$ = 5 Court$_B$ = 0 Not-approved	Court$_A$ = 1 Court$_B$ = 1 Not-Approved
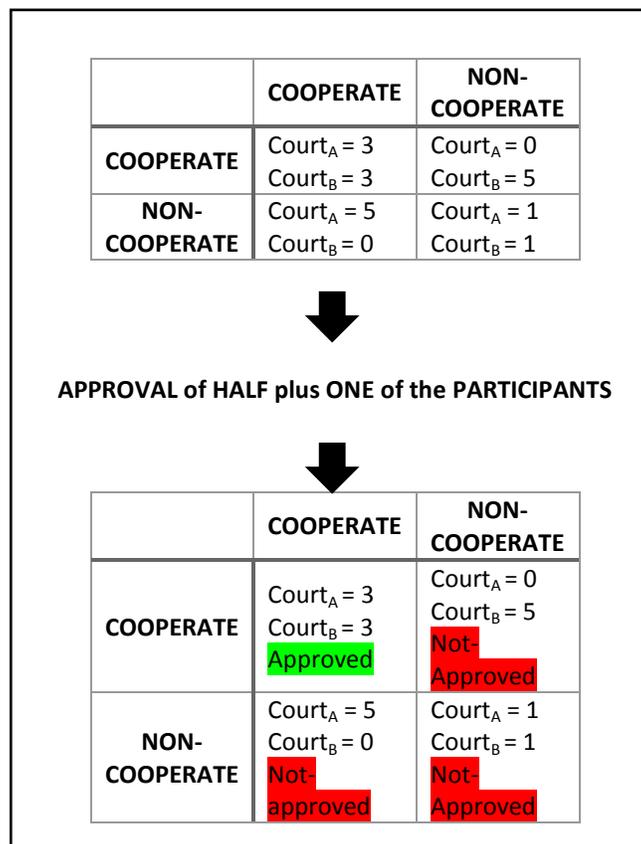
Figure 6 — Courts' strategic interaction, where the majority of participants must approve any court strategic behaviour.

5. Conclusions and proposals for forthcoming UNCITRAL lawmaking

UNCITRAL is strongly engaged in regulating cooperation. This activity is particularly appreciated—the UNCITRAL 'Model law' has enormously spread around the world the culture of cooperation in cross-border insolvency issues, while the UNCITRAL codes of best practices facilitate courts and insolvency practitioners in smoothly cooperating. Regulating cooperation will also be appreciated in the future. However, since regulating cooperation does not always succeed; and since cooperation is increasingly more crucial — for instance, in 2015 the European Union regulated group insolvencies mainly in terms of cooperation —[35] UNICITRAL ought to take into account the potentialities of governing cooperation by means of peer-to-peer IT networks adopting blockchain technology and smart contracts.

---

[35] See Arts. 56-77 of EU Regulation 2015/848.

For this purpose, UNCITRAL ought to:

- supplement Art. 27 of UNCITRAL 'Model Law on Cross-Border Insolvency', and, in so doing, suggest jurisdictions using peer-to-peer IT networks adopting blockchain technology and smart contracts in order to improve cooperation in cross-border insolvency issues;

- amend both UNCITRAL 'Guide to Enactment and Interpretation' attached to the 'Model Law on Cross-Border Insolvency' and UNCITRAL 'Practice Guide on Cross-Border Insolvency Cooperation' in those parts of both texts referring to Art. 27 of the 'Model Law';

- supplement Recommendations 240-250 of UNCITRAL 'Legislative Guide on Insolvency Law, Part Three: Treatment of Enterprise Groups in Insolvency' and, in so doing, suggest courts and insolvency practitioners adopting blockchain technology and smart contracts in order to improve cooperation in cross-border insolvency issues concerning companies belonging to multinational groups;

- facilitate academics dealing with cross-border insolvency law to carry out integrated research with academics who have IT expertise, in order to develop special-purpose databases and special-purpose DBMSs. Certainly, special-purpose databases and special-purpose DBMSs will be able to improve cooperation in cross-border insolvency issues better than the general-purpose ones are already capable of doing.