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2007

Chapter 3 - From Automation to Autonomy

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Available at: https://works.bepress.com/elizamik/5/

CHAPTER 3 FROM AUTOMATION TO AUTONOMY

Introduction

[3.1] This chapter deals with intention, contractual capacity and issues pertaining to the general validity of on-line contracts. It attempts to dispel some persisting doubts regarding the possibility to form contracts by means of automated processes. Problems of intention and contractual capacity must be dealt with before commencing a discussion of contract formation principles. Intention is commonly regarded as a matter affecting formation, whereas capacity impacts on the validity and enforceability of a contract.[1]

E-commerce is based on automated mass-market transactions,[2] on-line contract formation is usually automated on one side of the transaction.[3] E-commerce requires that computer-generated transactions are binding and effective in law. Customers visiting web-shops do not interact directly with people but with web-applications. There is little doubt that a contract is formed when a book is purchased on amazon.com. The only human on amazon's side is involved in packing the books.[4] This begs the question whether there is human participation at the moment of contract formation.

Allegedly, automated contracting encounters theoretical difficulties once computers not only transmit but generate output and operate without human supervision.[5] It is not automation per se but the elusive concept of "autonomy" that effectuates doctrinal discomfort: the old vending machine morphs into an "intelligent," "unattended" system that forms decisions of its own. "Autonomy" is associated with the concept of artificial intelligence and forces contract law into heated philosophical debate regarding the personhood of computers. Intuitively, it is tempting to ignore the sophistication of computers, treat automated contracting at par with non-automated contracting and distance oneself from such esoteric discussions. The necessity of this chapter could therefore be questioned.

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[1] Carter on Contract [02-020]

[2] Ford & Baum p 30

[3] The focus of this chapter is on websites, as contracts formed via email are more likely to include two human persons on both ends of the communication channel. Technically, email messages can be sent by automated processes, e.g. order confirmations or auto-of-office replies.

[4] The Electronic Messaging Task Force, REPORT: The Commercial use of Electronic Data Interchange – A Report and Model Trading Partner Agreement (1999) 45 Bus Law 1645

[5] T Allen, R Widdison, Can Computers Make Contracts? (1996) 9 Harv J Law & Tech 25 ("Allen & Widdison"); Ch C Nicoll, Can Computers Make Contracts (1998) JBL 34

A confrontation of theories accumulated around "automation" and "autonomy" cannot be avoided, though. First, problems of automation, usually couched in the term "electronic agent," form part of the legal landscape and recur in many discussions of e-commerce.[6] Second, with the progressive sophistication of information systems, bordering on the emergence of cognitive abilities,[7] there will always be arguments in favour of granting legal capacity to computers or questioning the existence of intention in automated transactions. Although problems of "automation" and computer-generated output have been largely solved by their explicit recognition in most model laws,[8] theories regarding the "emancipation" of computers linger on.[9] For all practical purposes, it is irrelevant whether the discussion centres on the generation of statements of computers, the automation of the contract formation process or the possibility of deploying electronic agents. All three relate to the existence of intention in the contract formation process, all three inquire whether offers and acceptances can be made through computers. This chapter injects some practical considerations into the discussion and proves that automated contracting does not need validation.

The problem can be described as follows: once output is not merely transmitted by computers but also generated by them, it becomes problematic to attribute such output to the person using the computer. A division is drawn between computers acting as a mere conduit for contractual statements and computers generating such statements. The main source of controversy is the concept of "autonomy." Once a system is "autonomous," i.e. attains a high level of complexity and operates in an unattended manner, it generates its own communications.[10] "Autonomy" is used to justify the theory that machines must be separated from their human operators and endowed with legal capacity. The validation of automated on-line transactions occurs through the attribution of computer-generated output to the computer.

Roadmap

[3.2] This chapter reiterates the simple principle that output produced by a computer is attributable to its user. This principle cannot be departed from on the basis that the computer is sophisticated and operates without human supervision. Such departure is attempted by those theories, which regard automation as a theoretical obstacle to the validity of contracts formed on-line. The theories fall into three categories: first, those that ascribe a separate existence to the computer; second, those that compare it to an agent; third, those that deny the existence of "intention" in automated transactions.

Their common assumption is that the deployment of automated systems challenges contract formation principles. Their common mistake is the separation of computers from their users in order to (a) validate automated contracting, and (b) protect computer users from unplanned computer-generated output.

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[6] J H Sommer, Against Cyberlaw (2000) 15 Berkeley Tech L J 1145 at 1178

[7] See, e.g. recent reports about computers acquiring rudimentary self-awareness: J Bongard, V Zykov, H Lipson, Resilient Machines Through Continuous Self-Modelling (2006) 314 Science 1118

[8] see: MLEC Art 11, Art 12, Art 13, which explicitly admit the validity and enforceability of data messages for contract formation and the definition of "data message" in Art 2, which encompasses the "generation" by automated processes; see also MLES Art 2 (c); CUECIC Art 4 (g) definition of "automated message system;" Art 12 "Use of automated message systems for contract formation;" UETA Section 2, definitions of "electronic agent" and "automated transactions" and Section 14 "Automated transactions."

[9] G Finocchiaro, Electronic Contracts and Software Agents: The Conclusion of the Electronic Contract through "Software Agents" A False Legal Problem? Brief Considerations (2003) 19 CLSR 20

[10] L E Wein, The Responsibility of Intelligent Artifacts: Towards and Automation Jurisprudence (1992) 6 Harv J Law & Tech 103

Automated contracting is pigeonholed into the frameworks of other legal institutions.[11] The relevant theories deny the validity of automated contracts or attribute them to the computer. Being a post factum justification of existing practices, the theories assume that because the law permits (or tolerates) automated contracting, it is the machine, which is contracting. Further problems derive from the terminology: "intelligence," "autonomy" and "agency." Such "humanization" culminates in attempts to justify the personhood of computers.

The chapter commences with describing the basic concepts used in discussions of automated contract formation. It presents the terms "electronic agent" and "user," "output" and "autonomy," including their practical application. Next, it raises a number of preliminary arguments relating to the relationships between "contractual capacity" and "intention," as well as between "attribution" and "liability." It critically revisits the concepts of "autonomy" and "unplanned output." The aim is to distance the discussions from a number of common arguments frequently made in legal literature and inject some common-sense into the analysis.

The chapter continues with a discussion of the main theories relating to the validation of automated transacting. Attempts at endowing the computer with legal capacity are discussed and criticized. The chapter illustrates the pitfalls of using the "agent" metaphor. Subsequently, it examines the existence of intention in automated transactions and the possibility to subsume computer-generated contracts under the objective theory of contract.

This and the following chapter are concerned with attributing electronic acts to persons. This chapter opposes any attempts at disassociating the human person from acts performed by means of a computer. It asks: is a human person responsible (i.e. bound by) for computer-generated statements? The next chapter attempts to establish the person behind such statement. Both chapters focus on the provenance of contractual statements, not on their electronic form.

This chapter commences two threads that recur at later stages: contractual statements are not only transmitted but also processed by computers and websites can often be analogized to vending machines. The latter comparison is one of the few instances where an analogy actually assists in the practical application of contract formation principles in the novel transacting environment.

BASIC CONCEPTS

[3.3] The following sections introduce the basic concepts used in legal discussions relating to the automation of the contract formation process.

Electronic Agent

[3.4] Electronic agents can be defined as "software that assists people and acts on their behalf."[12] The terms "agent," "intelligent agent" or "software agent"[13] are also used in reference to applications like message transfer agents and browsers. Not all programs encompassed by the term are relevant for this discussion. The focus is on programs directly facilitating the transaction process. Depending on the definition, "electronic agents" range from search engines, neural networks, the Internet itself to Microsoft

[11] L E Wein, above at note 10 at 129, discussing the inadequacy of rules that apply psychological concepts such as "consent" or "promise" to cases involving automated processes.

[12] D Gilbert, IBM Intelligent Agent White Paper 1997, available at www.networking.ibm.com./iag/iaghome/html

[13] S Gonzalo, Electronic Commerce Legal Issues Project ("ECLIP") A Business Outlook at Electronic Agents, Brussels 2000, at 3

Word's office assistants. "Electronic agents" are synonymous (for all legal purposes) with automation or the generation of output by computers.

There is no clear distinction between "electronic agents" and "computer programs." All electronic agents are computer programs[14] but not all programs are agents.[15] It is also difficult to state whether "electronic agents" are hardware or software. Hardware affects the speed and processing power, but is not decisive for the quality and content of the output. There is not need to differentiate between hardware and software as one cannot operate without the other.

Electronic agents are contrasted with faxes and vending machines. Facsimile is a technology with preset logic,[16] based on predictable computer behaviour. Apart from a minimal amount of signal processing, it is not programmed to change the transmitted data or generate communications of its own. The same can be said about vending machines, which operate in accordance with a simple set of instructions. Such "contrast" is no longer possible in the case of Automated Teller Machines ("ATMs") that consist of a relatively simple user interface, the ATM machine itself and a complex information system, which often encompasses a neural network and multiple databases. The same can be said of every payment-processing terminal at the point of sale. Individual components of information systems may not display high levels of sophistication. It may be difficult to establish whether a system as a whole is an electronic agent, or only one of its components deserves this label.

The most-cited properties of electronic agents are: social ability, reactivity, pro-activeness and -autonomy.[17]

Autonomy

[3.5] Problems of attributing computer-generated output to the user seem to arise only in the case of "autonomous" systems.[18] "Autonomy" is the most controversial characteristic: "[a]n agent's behaviour can be based on both its own experience and the built-in knowledge used in constructing the agent for the particular environment in which it operates. A system is autonomous to the extent that its behaviour is determined by its own experiences."[19] "Autonomous" machines learn through experience, modify their own programs and devise new instructions.[20] "Autonomy" is often linked to artificial intelligence, implying the ability to mimic human behaviour.[21] Electronic agents can manifest attributes of a "believable" character,[22] to the point where it may become difficult to distinguish whether one deals with a person or an automated system. When the system is so user-friendly and responsive that the counterparty has no awareness of the mediating technology, such system becomes transparent.[23] The replication of human responsiveness and the non-deterministic mode of operation leads to theories that autonomous systems have volition and make their own decisions.

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[14] see e.g. definition in UETA, Section 2 (6)

[15] S Franklin, A Greasser, Institute for Intelligent Systems, University of Memphis, Is it an Agent or just a Program?: A Taxonomy for Autonomous Agents; Proceedings of the Third International Workshop on Agent Theories, Architectures, and Languages, available at www.msci.memphis.edu/~franklin/AgentProg.html

[16] S Smed, Intelligent Software Agents and Agency Law (1998) 14 Computer & High Tech L J 503 at 505

[17] M J Woolridge and N R Jennings, Applications of Intelligent Agents in Agent Technology, Heidelberg 1998, p 4-5

[18] E Weitzenboeck, Electronic Agents and the Formation of Contracts (2001) 9 Int JLIT 204

[19] S J Russell and P Norvig, Artificial Intelligence: A Modern Approach , New Jersey 1995, p 31; see also: L Wein above at note 10 at 152, stressing the non-deterministic character of some automated systems.

[20] Allen & Widdison at 27; E Weitzenboeck, above at note 18 at 208

[21] Greenstein & Feinmann pp 331-333

[22] E Weitzenboeck, above at note 18 at 206

[23] Toh See Kiat p 32

Neither "electronic agent" nor "autonomy" has a universally accepted meaning or technical definition. Legal literature and model regulations use the terms loosely and fill them with different content. Effectively, both can be used to denote the generation of contractual statements by computers, the conclusion of contracts on websites or the automation of the contract formation process in general.

User

[3.6] Users of electronic agents are usually distinct from the persons who designed and programmed them.[24] For the purposes of the discussion, "user" refers to the person deploying the agent, i.e. deriving economic benefit from its operations. Deployment encompasses control based on ownership or licensing arrangements. "Users" of electronic agents are usually web-merchants who maintain websites with transactional capabilities. Electronic agents can be deployed at all stages of the transacting process, by both parties of the transaction. Electronic agents used by the customer, e.g. shopping bots,[25] are usually less complex than those deployed by the web-merchant.

Output

[3.7] The term "output" denotes the product of computer operations. Computer-generated output is a function of initial programming and subsequent input. It can take the form of email messages, pop-up windows or the real-time creation of web-content. Whatever its technical manifestation, the output may constitute an offer or acceptance and bring about the formation of a contract. In practical terms, output is whatever the person interacting with the web-merchant sees on his or her screen. In legal terms, output may constitute a manifestation of intention.

Practical example: websites

[3.8] Most websites fit under the definition of "electronic agent."[26] Their practical functioning illustrates the automation of the contract formation process. In on-line transactions, goods are ordered by means of email messages, order forms and virtual shopping carts.[27] Customers browse through menus and select products by clicking their images or descriptions.[28] After address and payment data are provided, websites calculate the price and shipping costs. Finally, confirmations presenting the items ordered and the total price are displayed or sent to the relevant email accounts.

The described interactions are not the result of large back-offices with hundreds of employees answering emails, checking the contents of virtual shopping carts and order forms. Websites are interfaces to complex, multi-tiered systems consisting of powerful servers, networking equipment and giant databases. A typical e-commerce system is composed of three types of servers: a web-server, an e-commerce server and a database server. [29] The above structure can be described as the back-end of an electronic commerce system. The front-end is the website itself: the graphical user interface consisting of HTML files hosted on the web-server. Websites display the output of the e-commerce engine and the database, while also serving as a means of collecting user input.

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[24] L E Wein above at note 10 at 105, 106

[25] see e.g., www.mysimon.com

[26] S T Middlebrook, J Muller, Thoughts on Bots: The Emerging Law of Electronic Agents (2000) 56 Bus Law 341

[27] W A Effross, The Legal Architecture of Virtual Stores: World Wide Web Sites and the Uniform Commercial Code (1997) 34 San Diego L Rev 1263

[28] P Loshin, J Vacca, P Murphy, Electronic Commerce, On-line Ordering and Digital Money, Hingham 2001, p 397

[29] For a more detailed description of e-commerce architectures see: G P Schneider, J T Perry, Electronic Commerce, Cambridge 2001, p 64, 65

Electronic agents operate on the front-end as well as at the back-end of virtual shops. At the front-end, Dynamic HTML constitutes the direct source of interactivity by controlling the behaviour of web-pages and responding to user events.[30] Client-side scripts compute the cost of the order, taxes and shipping charges.[31] Other examples include the display of messages when the mouse is positioned over pre-defined areas or after successful order submission.[32]

Websites are the product of multiple independent components operating at various levels of e-commerce systems. It could be claimed that websites consist of multiple interdependent electronic agents or the whole system can be regarded as one electronic agent. The second approach appears preferable as from the perspective of the person interacting with the website, he or she deals with one system. Technically, transactions occur via websites, not with websites. Websites are only interfaces, they display content that constitutes the output of computer operations occurring on the e-commerce server.

PRELIMINARY ARGUMENTS

[3.9] A number of preliminary arguments is made before reviewing the three main theories used to validate automated contract formation.

Validity and Attribution

[3.10] The validity of automated, or computer-generated, contracts is being questioned on two grounds: lack of intention and/or lack of contractual capacity. The attribution of computer-generated output to the computer derives not only from the alleged need to validate the automated contracting but also from the need to protect the user of the computer from the computer's unplanned or incorrect operations. Problems of capacity, intention, attribution and liability are therefore closely interrelated.

Capacity and Intention

[3.11] Capacity and intention are the prerequisites of a valid contract.[33] The principle remains the same in on-line transactions. Computers, however, have no contractual capacity and cannot form contracts. Furthermore, "intention" is a purely human phenomenon. Allegedly, if there are no humans directly involved in automated transactions, there is no "intention" and therefore no contract.

The relationship between "contractual capacity" and "intention" must be clarified. "Capacity" and "intention" are not synonymous. A contract can be invalid either due to lack of intention or capacity. The law grants contractual capacity to all human persons of a certain age and to corporations which meet statutory requirements.[34] As only human beings "have" intention, non-human entities with legal capacity are represented by human persons: the intention of the human representative is attributed to the corporation.[35]

Contractual capacity does not, however, imply the existence of intention. Similarly, the existence of intention does not imply or justify legal personality. Efforts to derive intention from the autonomous character of computers are therefore pointless because (a) intention is not a prerequisite of capacity and (b) for a contract to be formed and enforceable, intention must be accompanied by capacity. Capacity and

[30] D Flannagan, JavaScript, The Definitive Guide, Sebastopol 1998, p 11
[31] D Flannagan, above at note 30 p 12
[32] Deitel, Deitel & Goldberg p 181
[33] Carter on Contract [02-001]
[34] Carter on Contract [16-470]
[35] R P Austin, Ford's Principles of Corporations Law, 12th ed, Sydney 2005, paras 13.010 -13.050

intention are two separate prerequisites; one does not derive from the other. The absence of intention cannot be "cured" by the grant of legal personality.

Attribution and Accountability

[3.12] The "unattended" operation of computers often leads to the conclusion that agreements are no longer generated through computers but by computers.[36] The question, "are computer-generated contracts legally binding?" is followed by "if so, on whom are they binding?" The intermediation of the autonomous computer implies that its operations are no longer regarded as acts of its user. Accordingly, their output cannot be attributed to their users. This raises questions of accountability: one is responsible only for one's own acts, unless the law prescribes liability for the acts of third parties. As computers cannot be parties and be liable for the results of their operations a curious situation arises: if the user of the computer user is not automatically liable for the operations of the computer, who is?

It could be assumed that the person who deserves protection from the operations of automated systems is the person interacting with the system, not the person deploying it. Interestingly, literature focuses on protecting the latter, not the former.[37] If the e-commerce engine malfunctions and displays the incorrect price for a product, can the web-merchant escape liability by claiming system malfunction or computer error? The protection of the user is achieved by attributing the computer-generated output to the machine, which leads to attempts to separate the machine from its human operator.[38] Such separation is accompanied by a grant of legal capacity. Theories that sever the link between incorrect computer-generated output and the computer's user encounter difficulties in re-associating the correct output to such user.

This reasoning forms a vicious circle: if the computer is regarded as a separate entity, the user is protected from all incorrect computer-generated output, but (a) it becomes necessary to grant legal personality to the computer (otherwise there is nobody to be held accountable for unplanned output) and (b) it becomes difficult to attribute the correct input to the user.

Confining "Autonomy"

[3.13] Descriptive terms like "intelligent," "autonomous" or "unattended" overshadow the fact that electronic agents are nothing but computer programs. Before proceeding with the discussion, four points must be made.

First, electronic agents deployed in on-line transactions must not be compared to software operating planes or pacemakers. The focus is on the contractual aspects of electronic agents, not on "their" liability in tort. Theories built around the disastrous consequences of intelligent machines "gone mad" are described elsewhere.[39]

Second, irrespective of the non-deterministic character or sophistication of a computer, "autonomy" derives from original programming. A system is autonomous because it was programmed to be autonomous. It did not self-acquire this feature. The same argument applies to the "unattended" manner of operation. Computers may operate on the basis of self-learning algorithms, those algorithms, however, were created by humans. Systems are "autonomous" only in the sense that they operate without

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[36] I R Kerr, Commercial Law Strategy – Electronic Commerce, Providing for Autonomous Devices in the Uniform Electronic Commerce Act, available at www.ulcc.ca/en/cls/index.cfm?sec=4&sub=4f&print=1, p 12 of Internet version

[37] see: UETA Section 10, CUECIC Art 14; L E Wein, above at note 10 at 106, 107; Allen & Widdison at 36

[38] I R Kerr, above at note 36 p 16

[39] C Karnow, Liability for Distributed Artificial Intelligences (1996) 11 Berkeley Tech L J 147

[39] I R Kerr, above at note 36 p 9

the necessity of constant supervision. It is a human person who controls, operates, initiates and ultimately deactivates an electronic agent.[40]

Third, regarding "intelligence" and the resulting ability to interact with their environment, it must be remembered that electronic agents are designed to be user friendly and mimic certain human behaviours. Interactivity and complexity of response are not synonymous with intelligence. For a system to possess real intelligence, it must pass the Touring test,[41] i.e. it must understand the underlying transaction and the reactions of the other party. Most importantly, intelligence is not a prerequisite for intention.

Fourth, for contract law purposes, one must distance oneself from all arguments based on concepts like respondeat superior, vicarious liability, slavery, employment or any other institutions that impose liability for the acts of another person. It is irrelevant, whether a "human master is indispensable to assigning legal liability to an automated system."[42] The adoption of any of the aforementioned institutions would constitute an implicit recognition of the computer's personhood.

Risk of "Unplanned" Output

[3.14] Software is by nature unreliable.[43] Correct programming and error-free input do not always produce correct output. Malfunctions are statistically inevitable. It is also impossible to control all input and the environment computers operate in. The risk of malfunction and the difficulty of establishing its source increase proportionately with the sophistication of the system. [44]

Computers provide product data, calculate prices and shipping charges, exposing their users to potential errors each step of the way. As one author commented on e-commerce: "the speed with which a retailer can lose several million pounds can be matched in no other retail medium."[45] Three cases serve as an example. Argos refused to honour orders made through its on-line shop for television sets on sale for £ 2.99 instead of 299.99:[46] Eastman Kodak advertised a digital camera on their UK website at £ 100 rather than £ 329.[47] Digilandmall.com offered professional printers for 66 S$ instead of S$ 3000.[48]

Incorrect output must be distinguished from unplanned output. Computer-generated output may be incorrect, it may also be correct but unplanned or unwanted in that it does not reflect the original intention of its user and results in an unfavourable transaction. Unplanned output may derive from programming errors or from unpredicted input. It may also be the yield of a correct operation of the program, especially in the case of non-deterministic, distributed systems. Unplanned output need not be the product of a malfunction.[49] From a third party perspective, output produced by a malfunction may be indistinguishable from output produced by the correct operation of the program. The display of an "incorrect" price may be the result of a programming error but may also be the product of a self-learning algorithm, which "decided" to grant discounts to all customers. Unplanned output is therefore not synonymous with incorrect output.

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[40] J-F Lerouge, Symposium: UCITA: The Use of Electronic Agents Questioned Under Contractual Law: Suggested Solutions on a European and American Level (1999) 18 J Marshall J Computer & Info 403 at 405

[41] Toh See Kiat p 47; Turing proposed that a machine, in order to be regarded as a functional equivalent of a human being, would need to be able to converse remotely in such a way as to make it impossible for a person to tell he was speaking to a mechanical device; see: A M Turing, Computing Machinery and Intelligence (1950) 59 MIND 433

[42] L E Wein above at note 10 p 105

[43] C Karnow, above at note 39 at 161

[44] I R Kerr, above at note 36 at 10

[45] Ph Rees, R Calleja; News Update – E-commerce – Offers you can't refuse, (2002) 3 IJECL & P Ecom 1.4 at 1

[46] D Thompson, Contracting over the Internet – Argos's Failure to honour Internet Orders (2000) 53 IJECL & P Ecom 1.1 at 1

[47] Ph Rees, R Calleja, above at note 45 at 1

[48] Chwee Kin Keong v Digilandmall.com Pte Ltd [2004] SGHC 71

[49] I R Kerr, above at note 36 p 32

REVISION OF EXISTING THEORIES

[3.15] The following sections critically examine the three main theories used to validate automated contracting. The first attempts to separate the computer from its user and endow it with legal capacity, the second takes recourse to principles of agency law and implicitly regards the computer as a separate entity, the third denies the existence of intention in computer-generated transactions.

The computer as a separate entity

[3.16] No attempts were made to treat vending machines as persons. The situation remained unchanged with the emergence of EDI, which not only introduced a greater complexity of interactions but involved automated systems on both ends of the transaction. Only once computers became able to generate complex output and automation became common outside of closed networks, some concluded that it is time to acknowledge the separate existence of the machine.[50] Such conclusion was usually based on autonomy, which justified a quantum leap from machine to personality:

> "When computers are given the capacity to communicate with each other based upon pre-programmed instructions, and when they possess the physical capability to execute agreements on shipments of goods without any human awareness or input into the agreements beyond the original programming of the computer's instructions, these computers serve the same function as similarly instructed human agents of a party and thus should be treated under the law identically to those human agents."[51]

Or, as electronic agents are given greater autonomy

> "there could become a point where it would be legally appropriate to give autonomous agents the status of legal persons, particularly if it becomes more easy to attribute some form of identity to the intelligent agent."[52]

In sum, computers deserve a separate existence upon attaining a certain level of complexity.[53]

Unquestionably, theories based on moral and social considerations are "jurisprudentially exciting."[54] From a contract law perspective, a philosophical discussion as to when computers should be recognized as separate entities is not necessary. Technical sophistication translates into the capability to execute complex transactions. It does not, however, translate into legal capacity. The electronic agent's "capacity" is limited to following instructions. Complex output or unattended operation is not synonymous with intention or capacity. It is not a question of establishing what computers must be able to do for the law to treat them as persons.[55] There is no degree of autonomy that would enable the computer to become a separate person and generate its own acts and no threshold beyond which computers deserve legal recognition. The existence of such "threshold" is inconsistent with the view that the law must remain technology neutral. Capacity would effectively become a function of technology. The fact that electronic agents can perform the same functions as human agents, does not imply that they should be treated like human agents.

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[50] Allen & Widdison at 39

[51] J P Fisher, Computers as Agents: A Proposed Approach to Revised UCC Article 2 (1997) 72 Ind L J 545 at 570

[52] E Weitzenboeck, above at note 18 at 214

[53] see also: L B Solum, Legal Personhood for Artificial Intelligences (1992) 70 NCL Rev 1231

[54] L E Wein, above at note 10 at 152

[55] M Bain, E-commerce Oriented Software Agents: Legalising Autonomous Shopping Agent Processes (2003) 19 CLSR 5; Allen & Widdison at 37

Moreover, as computers do not "have" assets, it does not matter whether they have legal personality and whether they can be sued.[56] The only asset susceptible of economic evaluation is the software and/or hardware, which is difficult to identify in the case of distributed systems or multi-agent environments.[57] After all, computers are owned by their users…

Separation theories are based on a misunderstanding. Allegedly, entities become legal persons when the law attributes legally meaningful communications to them: "[l]egal persons are those entities that produce legal acts."[58] The law does not, however, attribute the output to the computer - it only establishes that such output is valid and enforceable.[59] The validity of automated transactions does not imply the legal capacity of the automaton. Computer-generated output is attributed to the merchant who operates the website, not to the e-commerce server.

The validity of automated contracting must be distinguished from capacity. Capacity would assume importance only if the accountability for the computer's unplanned operations had to be established. Questions of accountability, however, could only arise if the computer was a separate person. Separation theories create circular reasoning: computer-generated output must be attributed to the computer, therefore the computer must be endowed with legal personality. Problems of attribution arise only if the computer is regarded as a separate person and therefore a justification for the attribution of its output to its user is needed. If there is no separate legal entity, problems of validity and attribution…disappear!

Separation theories also disregard the fact that capacity is not synonymous with intention. To form contracts, the computer would have to be represented by a human person: on-line contracts would be made "through the instrumentality of human beings."[60] A human agent would be acting on the computer's behalf. The absurdity of this outcome requires no further comment.

The Computer as an "Agent"

[3.17] Comparisons with the agency relationship rely on the fact that "computers only replace what human agents are normally doing."[61] Human agents often perform tasks in a perfunctory and stereotypical way,[62] electronic agents can be programmed to respond with a complexity close to human.[63] Agents act on behalf of principals and have the power to alter the legal position of the principal.[64] References to agency principles remain a persistent trend.[65]

Agency appears to provide a perfect theoretical framework for the automation of contracts: agents are instruments of the principal, intention and contractual capacity belong to the latter, not the

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[56] J-F Lerouge, above at note 40 at 410

[57] Greenstein & Feinman p 335

[58] Allen & Widdison at 38

[59] MLEC, CUECIC, UETA acknowledge the validity of automated contracting without subsuming the "electronic agent" or the "automated system" under the definition of "person" or "intermediary", see: MLEC Art 2 definition of "originator" and "intermediary" and Guide to Enactment para 35; CUECIC Art 4 definition of "originator" and "automated message system;" UETA Section 2, definition of "electronic agent" as "computer program"

[60] Carter & Harland [857]

[61] J-F Lerouge, above at note 40 at 408

[62] L E Wein, above at note 10 at 147

[63] I R Kerr, M Bornfreund, Buddy Bots: How Touring's Fast Friends are Under-Mining Consumer Privacy (2005) 14 Presence: Teleoperators and Virtual Environments 6

[64] G H L Fridman, Fridman's Law of Agency, 6th ed, London 1990, p 80

[65] See: Electronic Transactions Bill 1999, Explanatory Memorandum, p 24; J P Fisher, Computers as Agents: A Proposed Approach to Revised UCC Article 2 (1997) 72 Ind L J 545 at 570; D D Wong, The Emerging Law of Electronic Agents: E-commerce and Beyond (1999) 33 Suffolk U L Rev 83 at 87; A J Bellia Jr, Contracting with Electronic Agents (2001) 50 Emory L J 1047

former.[66] As agency relationships may arise by operation of law the agent's consent or the principal's willingness to have his or her position changed by its actions are not absolute prerequisites.[67]

Numerous theoretical objections can be raised against such approach, starting with the statement that there being no two separate persons, there can be no agency relationship.[68] Temporarily disregarding this fallacy, the following sections proceed on the assumption that agency principles do apply. This operation demonstrates the pitfalls of separating computer-generated output from the computer-user. Attribution and validation based on agency principles are only possible if the computer is regarded as a person, which leads back to separation theories.

Authority

[3.18] Proponents of agency principles support their arguments with the constructs of actual and apparent authority.[69] "Authority" is a legal power held by the agent to perform acts directly affecting the principal's legal position.[70] "Actual authority" derives from a principal's consent, "apparent authority" results from the operation of law. If a person who by words or conduct has allowed another to appear to be his agent is treated "as if he had in fact authorised the agent to act in the way he has done."[71]

Applying the above rules to automated contracting, users confer power by putting computers into operation.[72] "Authority" is compared to original programming: if the computer is programmed to accept certain input and produce certain output it can be said that it has authority to perform operations to produce this output. If the agent is equipped with a self-learning algorithm and operates "autonomously," its operations can be compared to actions performed on the basis of a general authority. The principal decides how much discretion to leave to his representative. By creating the appearance that computers are operating under their authority, they effectively confer power to represent them.

As "apparent authority" relies on the perception of third parties,[73] the agent's acts can be attributed to the principal only if third parties think that they are transacting with an agent. The more sophisticated the agent, however, the more transparent its operations. Customers associate websites with the merchants who operate them. Websites are not perceived as separate entities. Third parties have no reason to believe they are transacting with an agent, it is therefore counter-intuitive to assume that they are analysing websites in terms of authority. Confining the application of agency principles to the external aspects of the agency relationship is problematic: third parties must assume the existence of two entities, principal and agent. If there is no perceived division into principal and agent, there can be no appearance of authority.

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[66] G H L Fridman, above at note 64 pp 50-51; I R Kerr above at note 36 p 36, F M B Reynolds, Bowstead & Reynold's on Agency, 16th ed, London 1968. pp 3-4

[67] G H L Fridman, above at note 64 pp 98, 119

[68] F M B Reynolds, Bowstead and Reynolds on Agency, 17th ed, London 2001, p.1; see also: M Bain, above at note 55 at 377

[69] I R Kerr, above at note 36 p 35

[70] Bowstead & Reynolds, above at note 66 p 6

[71] G H L Fridman, above at note 64 at 99; see also: Freeman & Lockyear v Buckhurst Park Properties (Mangal) Ltd [1964] 2 Q B 480 at 503 per Lord Diplock

[72] I R Kerr, above at note 36 p 35 "All that matters is that the person initiating the device had in fact consented to the operations of the electronic device."

[73] Bowstead & Reynolds, above at note 66 p 8

Unplanned Output

[3.19] Agency theories display further shortcomings when users attempt to limit their liability for unplanned output. The latter is compared to an excess of authority: "[w]hat happens if the electronic agent has operated in excess of its implied authority when it functioned in a particular manner so as to execute the instructions of the person who initiated his use?"[74] This statement is illogical: if an electronic agent executes the instructions of its user it cannot be exceeding its authority. If it operates on the basis of its programming, it remains within the bounds of its authority. The conclusion of unplanned or unfavourable transactions is therefore not synonymous with an excess of authority.

It is, however, contended that the user's responsibility for computer-generated output should be excluded where the computer operations "did not result in representations that allowed it to appear to the outside world as though the device was operating on her behalf."[75] On whose behalf was it operating then? If it is posited that the agent was operating on its own behalf, one returns to separation theories. Assumedly, the aforementioned statement refers to apparent authority: the agent-generated output must appear to be within the scope of authority. This approach, however, imposes the burden of investigating back-office operations on the person least able to do so.[76] As long as the output "fits" the commercial character of the website, the web-merchant is liable. Only when the output precludes reliance on the appearance of authority can the web-merchant's liability be excluded.

The ability to change a principal's legal position is not a question of the agent's autonomy. A simple bot can bind a web-merchant as effectively as an application comprising a self-learning algorithm. The only difference may lie in the difficulty of establishing whether the unplanned output was the product of a malfunction or an unexpected but correct operation. The principal's liability does not depend on the intelligence or education of its human representative. The characteristics of the agent do not change the liability of the principal. If the principal grants a general authority he or she is responsible for all resulting transactions.[77] An identical result should be achieved when the user employs a sophisticated system and leaves it discretion as to how to transact. Principals must bear the risk of inadequate representation. After all, it is easier to limit the scope of permitted operations of a computer than of a human being. It is in the user's interest to ensure correct programming and the incorporation of technological safeguards precluding contracts above a certain value or on particular terms.[78]

Ratification

[3.20] While the focus is generally placed on attributing incorrect or unplanned output to the computer, the attribution of correct output to the user is justified on the basis of ratification.[79] This can result in abuse: the user/principal can decide whether the output is advantageous in retrospect and selectively ratify some transactions.[80] Practical considerations aside, ratification assumes the existence of two separate entities and requires that the existence of the principal is known to the third party.

A theoretically correct solution must acknowledge that computers do not perform acts of their own. If there are no two independent legal entities, there is no need to establish a link between them – whether in the form of apparent authority or along ratification principles. Human agents are responsible for their actions and warrant their authority: if they exceed their authority, they are personally liable.[81]

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[74] E Weitzenboeck, above at note 18 at 213
[75] I R Kerr, above at note 36 p 38
[76] J Sommer, above at note 6 at 1184
[77] Bowstead & Reynolds, above at note 66 p 3
[78] Greenstein & Feinmann p 346
[79] I R Kerr, above at note 36 p 38
[80] Bowstead & Reynolds, above at note 66 p 54
[81] G H L Fridman, above at note 64 p 219

Agency theories are based on wrong premises: that computers are a separate rights-and-duty bearing entities and that persons transacting with computers perceive them as separate from their users.

SEARCH FOR INTENTION

[3.21] The automation of the contract formation process may lead to the conclusion that there is no human intention in the transaction or that intention is that of the computer. Allegedly, computer output is the product of human intention only when the computer is a passive conduit or when it acts upon "pre-programmed instructions, which can only be altered by the human trader."[82]

Three arguments can be raised to counter these theories. The first acknowledges the intermediation of the computer but focuses on the "remote," or prior, intention of its human user. The second relies on the objective approach to contractual intention. The third regards the computer as a tool. All three treat the operations of the agent as actions of its user thereby obviating the artificial process of attributing computer-generated output to computer users.

Remote Intention

[3.22] Allen and Widdison provide examples of human involvement in automated transactions.[83] In their scenario, the seller makes a computer available in a way that prospective parties can place orders with it. When asked the price of widgets, the computer calculates the price on the basis of a self-designed algorithm. The buyer places an order. The computer generates words that evince an intention to accept. But whose intention? The authors suggest three possibilities:

1. the seller's computer,
2. the seller's, or
3. the intention of the seller albeit embodied in the computer program.

Regarding option (1), the authors contend that as computers cannot be parties capable of expressing intention, there can be no contract. One can agree without further comment. Option (2) is discarded on the ground that the seller never knows of the transaction. Countering this argument: the seller does not want to know of the transaction. The very purpose of automation is to relieve web-merchants from personally overseeing the contracting process. The fact that the seller does not know about a particular transaction does not mean that he or she had no intention of entering into it.[84] The same accusation could be made with regards to contracts formed by human agents. Principals need not be aware or specifically intend every contract concluded by the agent.

Option (3) is criticized as unrealistic when agents operate autonomously. The authors ask: is it "more problematic to deem that an autonomous computer is capable of forming a relevant intention, or claim that the human trader has a specific intention when that claim is demonstrably untrue?"[85] This view must be strongly opposed. Reminiscent of attempts to associate autonomy and legal capacity, it ties the existence of intention to the technical complexity of a computer. Intention relates to the user's ability to operate and control the computer. In that sense, it is embodied in the computer program or manifested by the operations of the computer.

[82] Allen & Widdison at 48
[83] Allen & Widdison at 31
[84] Nimmer & Towle para 5.03[3]
[85] Allen & Widdison at 34

Most importantly, intention exists at the moment of formation. Although the minds need not meet in perfect simultaneity,[86] it can be assumed that the problem does not arise as intention persists as long as the computer or vending machine is held out.

To further explain the point, it must be noted that "intention" is often equated with "decision."[87] The term "decision" is also used in technical literature in reference to the execution of commands based on the occurrence of a condition.[88] Electronic agents are allegedly "entirely free to decide when transactions may occur and to negotiate the terms of the contract according to the way they were programmed.[89]" [my emphasis] This statement is illogical: how can a computer be "free to decide" if it operates in accordance with earlier instructions?

Electronic agents do not make their "own" decisions, but execute earlier human decisions within the limits of pre-set parameters.[90] The original decision consists in programming and deploying the agent and need not relate to all discrete future transactions.[91] Technically, computers "make" individual decisions as to whether and when to enter into particular transactions. Despite the absence of human involvement at the time of formation, intention is traced back to an earlier moment. Computers are programmed to dynamically react to specified input. Automation "enables transactions to be made precisely at the size and exactly at the time needed for the particular transaction."[92]

The "remoteness" of intention is a consequence of the interval between the programming and the generation of the final output. Programming can be equated with the making of a decision to enter into transactions. The parameters of the transaction are set at the time of programming and consist in the repetition of a specific sequence or vary in accordance with future events. The remoteness of human involvement does not sever the link between the user of the computer and the output generated by the computer. The "autonomy" of the agent's operations does not change anything in this regard. Irrespective of its complexity, every operation of the computer derives from an earlier human act.[93]

Objective Intention

[3.23] The search for intention can be called off if technological complexity and remoteness of human involvement are disregarded. The existence of agreement is determined on the basis of external manifestations of intention.[94] Courts wont explore the human mind or trace back the statement's mental origin.[95] The test is objective: apparent intention suffices to bind the alleged offeror. The existence of intention cannot be questioned on the ground that the decision to contract was formed with the assistance

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[86] Kennedy v Lee 36 Eng Rep 170 (Ch 1817); J M Perillo, The Origins of the Objective Theory of Contract Formation and Interpretation, 69 Fordham L Rev 427 at 439, 440

[87] L E Wein, above at note 10 at 122

[88] Deitel, Deitel & Goldberg p 194

[89] J-F Lerouge, above at note 40 at 405 The same author, while commenting on section 112 (b) of UCITA, critically observes that "speaking of assent by electronic agent is a heresy" at 423

[90] Nimmer & Towle para 5.03[3], see also: R Nimmer, Electronic Contracting: Legal Issues (1996) 14 J Marshall J Computer & Info L 211 at 212; R Nimmer, Contract Law in Electronic Commerce (2000) 587 PLI/Pat 1127

[91] See UETA section 14 and comment 1 thereto: "When machines are involved, the requisite intention flows from the programming and the use of the machine." A similar view was expressed by A Liegl, P Brautigam, A Leupold, in: Law of International On-Line Business, A Global Perspective, London 1998, p 394

[92] M B Andersen, Electronic Commerce: A Challenge to Private Law? Centro di studi e ricerche di diritto comparato e staniero, Roma 1998, at 13

[93] M Gimmy, Vertragsschluss im Internet, in: D Kroeger, M Gimmy, Handbuch zum Internetrecht, Berlin 2000, p 86; "A declaration that is generated automatically in accordance with fixed rules may always be viewed as a declaration of intention on the part of the operator." German scholars recognize so-called "computer-declarations" ("Computererklaerung"): manifestations of intention generated by information systems.

[94] E Weitzenboeck, above at note 18 at 219

[95] Cheshire, Fifoot & Furmston p 29; Carter on Contract [01-090]

of a computer. The initial programming or the complexity of the algorithm are equally irrelevant as the subjective state of mind.

A reasonable addressee of a statement does not analyse it in terms of authority or autonomy. The output generated by an autonomous super-computer may be identical to output created without any computer participation. The origin of a statement need not be apparent from its contents. Quite the opposite: super-computers will most likely generate statements identical to those "generated" by humans! The question is whether a reasonable person would think the other party intends to contract on the terms provided.[96] A reasonable person will not be able to tell whether the computer only served as a conduit, a means of manifesting intention or whether it generated the statement on the basis of a self-learning algorithm.

Intention may be expressed in any manner – also by means of automated systems. The objective theory disregards the decision-making process behind the statement and – most importantly – the fact that a statement was not only transmitted but also generated by a computer. Both occurrences are transparent to the other party and therefore irrelevant.

The computer as a tool

[3.24] An alternative approach regards computers as tools. It relies on the objective theory of contract, disregards technological complexity and preserves technological neutrality. Automation and autonomy do not change the fact that it is the human user who initiates and controls the computer.[97] This reasoning underlies the approach adopted in UETA[98] and reflects in the scarce case law on the subject. Two observations must be made with regard to the latter. First, the validity of automated transactions was never questioned. Second, it must be admitted that the cases concerned relatively simple automatons, not highly complex "contracting machines."[99] Most cases derive from the US and involve insurance companies, ATMs, coin operated lockers and ticketing machines.[100]

In State Farm Mutual Insurance Co v Bockhorst, computer errors were regarded as errors of its human controllers.[101] The fact that the data processing was carried out by a computer did not affect the company's responsibilities for errors and oversights. As it is human beings who instruct computers, "if the computer does not think like a man, it is a man's fault."[102] Because the defendant company failed to provide correct input, the resulting output was not the consequence of a computer error.[103] If the human operator fails to program the computer appropriately or fails to provide correct data, he or she cannot claim that his or her action was the result of "unyielding and unimaginative processes of a computer."[104] Similarly, without any attempts at anthropomorphosis, the court in Thornton Shoe Lane Parking[105] stated that the machine was nothing else but a presenter of the defendant's offer. All arguments converged on the same conclusion: law protects those who reasonably rely on the communications emanating from the computer.

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[96] P Atiyah, Essays on Contract, Oxford 1990, p 21
[97] Allen & Widdison at 46
[98] see: UETA Section 2, comment regarding subsection (6) "electronic agent".
[99] Cushing v Rodman 82 F 2d 864 n29 (DC Cir 1936); Child's Dinning Hall Co v Swingler 197 A 105 (Md 1938); Seattle v Dencker 108 P 1086 (Wash 1910)
[100] See: Bernstein v Northwestern National Bank in Philadelphia 41 A2d at 442; American Meter Co v McCaughn 1 F Supp 753 (E D Pa 1932); Marsh v American Locker Co 72 A 2d 343 (NJ Super Ct 1950); Ellish v Airport Parking Co of America 345 NYS 2d 650 (NYAD 1973); Lachs v Fidelity & Casualty Co of NY 118 NE 2d 555 (NY 1954)
[101] State Farm Mutual Automobile Insurance Co v Bockhorst 453 F 2d 533 (USCA 10th Circuit 1972)
[102] State Farm Mutual Automobile Insurance Co v Bockhorst 453 F 2d 533 at 536
[103] A similar situation arose in Chwee Kin Keong v Digilandmall.com Pte Ltd [2004] SGHC 71
[104] State Farm Mutual Automobile Insurance Co v Bockhorst 453 F 2d 533 at 537
[105] Thornton v Shoe Lane Parking Ltd [1971] 2 QB 163

Remaining under the permanent control of their users, they are tools deployed for the purpose of entering into transactions of varying degrees of complexity.[106] The electronic agent is nothing more than a "booking clerk in disguise"[107] From a contract law perspective, it should not matter whether merchants conduct business with the assistance of human employees or via computerized systems. Treating the computer as a tool "puts the risk of unpredicted obligations on the person best able to control them – those who program and control the computer."[108] This approach encourages diligent programming and supervision.[109] Anticipating objections that it effectively equates a hammer with a neural network, it can be assumed that this is a small price to pay for contractual certainty, the preservation of the basic theories underlying contract law and, last but not least, the avoidance of creating a separate legal regime for automated transactions. Most importantly, the law focuses on the output of the tools operations, not on the complexity of the tool. The user is responsible for the computer – even if the computer "behaves badly."[110]

PROTECTIVE MECHANISMS

[3.25] Computer users must bear the consequences of malfunctions and programming errors. By initiating the computer, they accept that contracts concluded by the computer are binding on them. Such approach is reflected in most model regulations: acts of the computer are attributed to its user.[111] None of the model regulations creates a special liability regime for automated transactions. Is it fair, however, to hold users liable for all unplanned or incorrect computer-generated output? The risk of malfunction and propensity of input errors create the necessity to provide protective mechanisms for both users of the computer and the persons transacting with them.

Protecting the User

[3.26] The protection of the user does not require the separation of the computer or recourse to agency principles. Protection is granted by the principles of unilateral mistake,[112] which can be adopted to encompass computer errors[113] or, alternatively, on the basis of lack of contractual intention.[114] Where the other party should be reasonably aware that a statement does not represent the intention of its maker, that party is in the best position to reduce the costs of unexpected obligations.[115] One cannot legitimately expect to take advantage of appearances when the "actual reality of the situation is starkly obvious"[116] or "snap up" offers which cannot reasonably represent the intention of their makers.[117]

Problems arise when computer-generated output remains within the bounds of commercial reasonableness. The Internet is famous for commercial offers bordering on absurdity. It may be impossible to draw a line as to what constitutes a reasonable transaction. If the output is such that the other person

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[106] Chissick & Kellman p 77
[107] Thornton v Shoe Lane Parking Ltd [1971] 2 QB 163 at 169
[108] Allen & Widdison at 46; see also: M J Radin, Humans, Computers and Binding Commitment (2000) 75 Ind L J 1125 at 1128
[109] I R Kerr, above at note 36 p 31
[110] eBay Inc v Bidder's Edge Inc 100 F Supp 2d 1058 (ND Cal 2000)
[111] MLEC Art 13, this approach is also implicit in CUECIC and UETA, which do not provide special attribution rules apart from admitting the possibility of forming contracts by automated means, see UETA Section 14 and CUECIC Art 12
[112] Hartog v Colin Shields [1939] 3 All ER 566; Smith v Hughes (1871) LR 6 QB 597
[113] J Sommer, above at note 6 at 1184
[114] Hartog v Colin Shields [1939] 3 All ER 566 at 568; Taylor v Johnson (1983) 151 CLR 422
[115] Allen & Widdison at 46
[116] Chwee Kin Keong v Digilandmall.com Pte Ltd [2004] SGHC 71 at 105
[117] Tamplin v James (1880) 15 Ch D 215; see generally: Ter Kah Leng, Legal Effects of Input Errors in eContracting (2006) 22 CLSR 157-164

has no reason to know that it was not intended (i.e. incorrect), the user should be liable.[118] The decision turns on the question: was the mistake apparent to a reasonable man?[119] It was recently noted that the tendency is to extend actual knowledge to deemed or constructive knowledge.[120] It is also claimed that users of electronic agents assume the risk of incorrect or unplanned output, including the cost of "unwanted contracts being concluded by mistake and the cost of the technical tools and procedures employed to reduce the probability of mistakes."[121] In sum, a difficult balance must be struck between the objective evaluation of contractual intention and the imposition of a minimal investigative burden whether the price displayed is "too good to be true."

Protecting the other party

[3.27] Certain mechanisms aim at protecting parties transacting with automated systems. Web-merchants using automated contracting procedures are often required to provide so-called "confirmation screens." The latter constitute an opportunity to prevent or correct errors from the side of the person visiting the website.[122]

UETA deals with errors in transmission only, errors in the generation of messages are relegated to the principles of mistake.[123] CUECIC, in contrast, specifically addresses input errors in communications exchanged with automated message systems.[124] Absent an opportunity to correct the error, the person interacting with the automated system has a right to withdraw the communication containing the input error, provided a number of conditions are met. CUECIC limits the right to withdraw to input errors only and relegates errors made in the formation process, such as computer malfunctions, to other rules of law. Neither UETA nor CUECIC deal with errors in the generation of contractual statements.

ETA does not introduce the concept of "generation" and does not define "originator" as a person on whose behalf a message might have been generated. Automated contract formation must therefore be validated on the basis of general principles

The mechanisms of protecting persons transacting with automated systems constitute a subtle modification of the formation procedure. In real-world transactions, parties are generally bound by their manifested intention and are not given the opportunity to correct or retract previously made statements. The provisions dealing with input errors can be regarded as a recognition of the dangers posed by the novel transacting environment, particularly of the cognitive difficulties of web-based transactions. The position of user of the automated system remains unaltered.

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[118] Corbin para 105

[119] Taylor v Johnson (1983) 151 CLR 422; see generally: A Phang, Contract Formation and Mistake in Cyberspace (2005) 21 JCL 1 at 202; Lee Pey Woan, Unilateral Mistake in Law and Equity – Solle v Butcher Reinstated (2006) 22 JCL 81

[120] see: Chwee Kin Keong v Digilandmall.com Pte Ltd [2004] SGHC 71 per V K Rajah JC at 109

[121] S Cavanillas & A Martinez Nadal, ECLIP Project Deliverable 2.1.7 bis "Research Paper on Contract Law," para 1.2.5 available at www.jura.uni-muenster.de/eclip/eclip_l.htm

[122] CUECIC Art 14 "Error in Electronic Communication;" UETA Section 10 "Effect of Change or Error", see also European Directive on Electronic Commerce Art 10.1 (c), The Australian Guidelines for Electronic Commerce, March 2006, par. 34.2, available at ; www.ag.gov.au/cca

[123] UETA Section 10

[124] CUECIC Art 14

Conclusion

[3.28] Automation comports with the objective evaluation of contractual intention and with the possibility to express such intention in any manner. The introduction of "autonomy" as a primitive in establishing the existence of intention and the legal capacity of computers would imply that such intention and capacity come in varying degrees. Contractual capacity cannot be based on computing power or the complexity of an algorithm. There can be no threshold beyond which there is a necessity to establish a link between the computer and its user in order to attribute computer-generated output to the user. No matter how sophisticated, computers are tools, with no possibility of ascribing their output to anyone but those who use them.

Liability for a contractual statement cannot be avoided on the ground that such statement is the output of an incorrect or unplanned computer operation. Disassociating the computer-generated output from the user of the computer creates the need to grant legal personhood to the machine, which in turn necessitates the representation of the machine by a human agent.

Computers may be used to arrive at a particular decision, the resulting output may be communicated by a human person. As humans can manifest computer-generated output, the distinction between generation and manifestation is unwarranted. Contract law is indifferent to the fact that a message was not only transmitted but also generated by an information system. Contracts cannot be denied effectiveness because of the medium on which they were concluded or because of the way contractual statements originated.[125]

The term "agent" adds unnecessary complexity resulting from the fact that agency presupposes the existence of two entities. Web-merchants are bound by the output produced by their computers not because the computers are their agents but because they deployed them.

The validity of automated transactions need not result in the separation of machines from their human users. Contract law can accommodate automated contracting by adhering to the objective approach to contractual intention. Users of automated systems can be protected from incorrect or unplanned, output by classic principles of mistake, without the necessity to emancipate the computer.

From a contract law perspective it is irrelevant whether a statement is:

- Generated by a computer, i.e. it is the product of a computer operation
- Manifested by a computer, i.e. the computer acts as a conduit only
- The output of:
    - a correct operation of the computer program
    - an incorrect operation of the computer program
    - a correct but unplanned operation of the computer program.

None of the above circumstances need be apparent from the contents of the statement. It is objectively impossible to determine the existence of an error in generation or transmission, as well as the provenance of the contents displayed on websites.

[125] This principle underlies practically all model laws: see MLEC Art 5, CUECIC Art 8, UETA Section 7, ETA Section 8