

The Reasonable Coder

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Abstract

Algorithmic decision-making tools are no longer a mere field of scientific exploration and academic debates. Today data, code and algorithms, blended altogether in the concept of Machine Learning (ML), are used to identify potential aggressors and victims of violence, to assess a defendant's risk of committing new crimes, to decide whether you deserve a job opportunity, to –literally- monitor the financial markets or to evaluate school teachers. In light of these ML applications, an exponentially growing part of the scientific community has focused its attention on the issues of fairness, transparency and accountability that algorithms should mirror. Building next to these interdisciplinary endeavours for the development of safeguarding techniques, this paper is an attempt to explore the boundaries of liability that surround the agents involved in the development of these tools.

The capacity of these systems to interact and trigger changes to the physical world as well as their potential for causing harm to a person challenges the notions of duty of care, causality and foreseeability that historically dominated liability ascription. In the meantime, the absence of a solid regulation renders developers legally exposed to the rules of strict liability. My paper is a jurisprudential journey throughout the boundaries of contract and tort law of USA jurisdictions aiming at extracting common principles that could shape the proposed doctrine of the “Reasonable Coder”. This journey starts from the fundamental question of whether smart-software should be regarded as “good” or “service”, and progresses to approach the normative connotations of the concepts of causality and foreseeability in the digital sphere. The notion of “Reasonable Coder” is ultimately premised on the idea that either regarded as “services” or as “products”, smart-systems will eventually be examined through the regime of negligence.

Keywords:

tort law, computational technology, reasonableness, causation

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The Reasonable Coder

Introduction

It was a rainy day, September the 1st, and Carol was getting ready for the first day at her new school. The trip from her homeland was so long but thanks to her assiduous mother, Herianna, she was finally there. Herianna had been through depression but now she was back on track. Taking advantage of Carol's first day at school, she has scheduled her first day at her new job on that date, as a symbolism to mark the new beginnings. Herianna walked her daughter at school and discretely remained at the schoolyard to watch her getting inside. The automatic door didn't seem to work on the first attempt. Carol scanned her card again. "Access denied". She glanced at the second door. Kids, one after the other, were passing through. A long queue with children looking suspiciously had been waiting behind her. Others along with their parents were pushing their way from the back of the queue to protect themselves from the rain. Shouldered aside, Carol fell down the wet stairs. Her mother was already there. She called the school doctor and tried to console her daughter "These systems fail sometimes darling" she said. "Yes, but why me, mum?"

While waiting for the doctor to arrive, Herianna called the entrance system's supervisor. "Unfortunately, access was denied due to security reasons and as a result, I am afraid I am not allowed to know more, you see, it's personal data". Herianna already knew that she wouldn't manage to bear the burden of disappointment. And she was proved right. On the way to her new workplace, she collapsed in front of her daughter.

A week later the security issue was sorted out. After receiving an apologetic phone call, Carol returned to school and passed the automatic door. But her mother was in depression again. She took her 6 months of consultation and medication to recover. At the end of these six months, she had suffered depression, emotional distress from seeing her child pushed and falling down and she had lost a job as well. Her daughter had suffered injuries, lost a week of studying and gained the suspicion sights of her classmates.

Who is accountable to give a solid explanation to Carol's "Why me"? Who, subsequently, must be held liable for these harms?

"The AI programs of interest, the successors to today's [1990] intelligent agents, will collect information without an express instruction to do so, select information from the universe of available data without direction, make calculations without being told to do so, make recommendations without being asked and implement decisions without further authorization¹".

Algorithmic decision-making tools are no longer a mere field of scientific exploration and academic debates. Today data, code and algorithms, blended altogether inside the trees and networks of Machine Learning, are used to identify potential aggressors and victims of violence², to assess a defendant's risk of committing new crimes³, to decide whether you deserve a job opportunity⁴, to – literally- monitor the financial markets⁵, to evaluate school teachers⁶ *etcetera*. In light of these machine learning applications, an exponentially growing part of the scientific community has focused its attention on the issues of fairness, transparency and accountability that algorithms should mirror⁷. At the same time, all this emerging research fueled by the evolution of computational technology will eventually call for the adaptation of tort law to the new reality. *Andrew Selbst* says it well in a forthcoming article: “[T]ort law may not have the chance to reimagine reasonableness before another wave of technological change is upon us⁸”.

Emanating from these pillars, this paper will draw on *Ryan Calo's* work on tort liability for robotics⁹ and the author's early remarks on foreseeability and proximate cause. At the same time, this paper will attempt to build on the work presented at WeRobot 2017 by William D. Smart, Cindy M. Grimm and Woodrow Hartzog¹⁰. In that article, the authors classified different types of harms and duties that emerge from the “activity” of automated decision-making systems and shaped the ground for future research. This paper focuses on the use of automated decision-making system and aims at providing a framework for the adaptation of core tort law regimes to the new environment.

¹ Maruerite E. Gerstner, “Liability Issues with Artificial Intelligence Software”, 33 *Santa Clara L. Rev.* 239 (1993)

² Ali Winston, “New Orleans Ends Its Palantir Predictive Policing Program,” *The Verge* 2018.

³ Ed Yong, “A Popular Algorithm Is No Better at Predicting Crimes Than Random People,” *The Atlantic* 2018.

⁴ Bartleby section, “How an Algorithm May Decide Your Career,” *The Economist* 2018.

⁵ Felix Salmon and John Stokes, “Algorithms Take Control of the Wall Street ” *Wired Magazine* 2010.

⁶ Valerie Strauss, “Errors Found in D.C. Teacher Evaluations (2nd Update) ” *The Washington Post* 2013.

⁷ See generally “Acm Conference on Fairness, Accountability, and Transparency (Acm Fat*),” 2019, <https://fatconference.org/>.

⁸ See Selbst, Andrew D., “Negligence and AI's Human Users”. *Boston University Law Review*, Forthcoming. Available at SSRN: <https://ssrn.com/abstract=>

⁹ See Ryan Calo, “Open Robotics”, 70 *Md. L. Rev.* 571 (2011); Ryan Calo, “Robotics and the Lessons of Cyberlaw”, 103 *Calif. L. Rev.* 513 (2015)

¹⁰ See William D. Smart, Cindy M. Grimm & Woodrow Hartzog, *An Education Theory of Fault for Autonomous Systems*, (2017)

Two remarks are essential at this point. The first is related to the use of the word “coder”. Without disregarding the fact that “coder” is perceived as “the one who codes”, I will endow her with a broader meaning. “Coder” for the purposes of this analysis is “the person who uses skills and discretion while contributing to any part of an autonomous system”. Allow me this poetic license for it is chosen for the sake of uniformity. Instead of categorizing among designers, software developers, machine learning engineers, data architects, data collectors, data analysts, *etcetera* we use the term “coders” to embrace them all. The reason for this choice is rather symbolic. Apart from the *stricto sensu* typing of commands in *Python* or *Java*, the essence of coding is manifested everywhere in the world of programming. Either you are the designer of an autonomous system or its data analysts, you think and act in “if this-then that” statements. However, not “every coder” is equal in terms of responsibilities. For this reason, as I proceed to the end of the current analysis I will differentiate the approach accordingly.

The second preliminary remark concerns our smart-system. Equally, I will use the collocations “smart-software”, “smart systems”, “AI systems”, “decision-making tools”, “automated/autonomous decision-making systems” to refer to the same article. This remark is not purely terminological however, for it demonstrates the specific field of the present analysis. This paper will not discuss best coding practices, nor algorithmic tools for transparency and explainability nor liability issues arising from defective robots and autonomous vehicles. This paper will focus on the “inbetween”¹¹, the elusive “things” that are “born and raised” by the dynamic coupling of codes and algorithms within a complex machine learning system and are capable of reaching outcomes that humans subsequently regard as decisions.

The aforementioned story of Herianna and her daughter will accompany the reader throughout the analysis. There are some blank spots intentionally left for structural purposes. Hopefully, by the end of this paper, the reader will have a solid understanding of the facts and the flow of legal reasoning. Although the scope of this paper is to explore the dimensions of tort liability in cases of harm caused by the function of smart-systems, I believe that such an endeavour would be futile unless we firstly immerse into the most plentiful source of jurisprudence for the world of software. Contract law. It has been persuasively supported that when it comes to the nature of responsibility and liability that involves traditional computer software and advanced smart-systems, contract and tort law need each other¹². Managing the confluence of these fields of law is, therefore,

¹¹ See MIREILLE HILDEBRANDT, SMART TECHNOLOGIES AND THE END(S) OF LAW, (2012). The term “inbetween” is used by Hildebrandt to connote the space in the boundaries of physical and digital, where we, individually, act.

¹² See Joseph L. Reutiman, "Defective Information: Should Information Be a Product Subject to Products Liability Claims," 22 *Cornell J. L. & Pub. Pol'y* 181 (2012). (“For this reason the *Restatement (Third) of Torts :Product Liability 1998* : when a court will have to decide whether to extend strict liability to computer software, it may draw an analogy between the treatment of software under the Uniform Commercial Code and under product liability”)

necessary if products liability is to stand on a strong legal foundation¹³. The drafters of the Uniform Commercial Code (UCC) revision also acknowledged the need for coordination between the two projects¹⁴. Indeed, the nature of our coder's liability, and whether she should be held strictly liable or according to common law principles of negligence, cannot be distinguished from the obligations she undertook when agreeing on the specific development task. Hence, our analysis further answers to the necessity of cultivating a solid degree of homogeneity with regards to the concept of smart-software.

Hence, Part 1 is a jurisprudential journey in contract case-law. The review in this part is structured in chronological order so as to manifest the not so parallel progress of law and technology. The gist of this part is solidified in a twofold test for judging whether a smart-system should be considered as "goods" or "services". Part 2 is the core part of this paper. By being developed in a conditional structure, Part 2 examines how the law would adjust if a smart-system were classified as "product" or as "services". It then proceeds with a discussion on the recoverable damages and the admissibility of claims involving economic loss and emotional distress. Lastly, by focusing on the issues of duty, causation and reasonableness, the final sub-chapter attempts to renew the normative connotation of the notions of causality and reasonableness and endow them with a dose of computational awareness. One final remark regarding the structure needs to be made. In the sub-section of emotional distress, an interlude will interrupt the normal flow of the paper. It is a short deviation from the scope of the paper but I hope you will find it interesting and.

¹³ David W. Lannetti, "Toward a Revised Definition of Product under the Restatement (Third) of Torts: Products Liability," 35 *Tort & Ins. L.J.* 845 (2000).

¹⁴ *Id.*

Contractual liability

Prior to September the 1st, our coder, following a gun-attack that took place earlier that year, agreed to undertake the task of developing a smart-system for controlling access to the school premises. The system would be based on facial-recognition technology for identifying pupils' ID. In parallel, it would be supported by a constantly renewed database which would include an indefinite amount of data, including but not limited to information on close family members, relatives and social interactions. Finally, apart from the software development part, the agreement included the sale of adequate equipment.

The distinction

Whether a transaction involving computer software is viewed as “sales of goods” or “supply of services” is legally significant and “not purely semantic”¹⁵. The UCC and common law differ in significant ways on “contract formation and interpretation rules”¹⁶. Article 2 of the UCC¹⁷ applies to the sale of goods¹⁸. Conversely, common law applies to the supply of services. As a result, while sales of goods are subject to the U.C.C.'s implied warranties of “merchantability”¹⁹ and “fitness for particular purpose”²⁰ and their common law precursors, sales of services are not²¹. The yardstick for the evaluation of the

¹⁵ Spencer Gottlieb, "Installation Failure: How the Predominant Purpose Test Has Perpetuated Software's Uncertain Legal Status under the Uniform Commercial Code," *113 Mich. L. Rev.* 739 (2015).

¹⁶ *Id.*

¹⁷ Hereinafter “UCC” refers to “Article 2 of UCC” unless stated otherwise

¹⁸ UCC 2-105:

“Goods” means all things (including specially manufactured goods) which are movable at the time of identification to the contract for sale other than the money in which the price is to be paid, investment securities and things in action”

¹⁹ UCC 2-314:

1) Unless excluded or modified (Section 2-316), a warranty that the goods shall be merchantable is implied in a contract for their sale if the seller is a merchant with respect to goods of that kind. Under this section the serving for value of food or drink to be consumed either on the premises or elsewhere is a sale.

²⁰ Article 2-315 of UCC states:

2) Where the seller at the time of contracting has reason to know any particular purpose for which the goods are required and that the buyer is relying on the seller's skill or judgment to select or furnish suitable goods, there is unless excluded or modified under the next section an implied warranty that the goods shall be fit for such purpose.

²¹ Jay E. Harker, "A Dinosaur, a Citadel and a Dogma: Implied Warranties of Goods in Mixed Transactions," *97 Com. L.J.* 485 (1992).

latter is not the “perfect defect-free services” but those provided with the required -according to the circumstances- reasonable care.

It should be mentioned from the very beginning that a detailed critic of the Predominant Factor Test²², the need for a revised UCC²³ and the Uniform Computer Information Transactions Act (UCITA) remains out of the scope of this paper. Without disregarding the prerequisite of understanding the couplings between the aforementioned regimes, our goal here is not to draft policy-recommendations but to unravel the history of the relevant case-law, to extract what we consider useful for the judge and ultimately connect the analysis with our final concept of “reasonableness”.

From the late 70s until recently, courts dealt with cases involving software by adopting an *ad hoc* approach²⁴. The most influential criterion that has been used by courts throughout this time in order to determine the nature of software is the *Predominant Factor Test*. Apart from its questionable applicability in smart-software cases, the consistent loyalty shown by the courts to this test is useful for another reason. The Predominant Factor Test reveals in a unique way the gradual shift of courts’ perception on the relation between

²² See for example Leslie M. Bock, "Sales in the Information Age: Reconsidering the Scope of Article 2," *27 Idaho L. Rev.* 463 (1990); Charles E. Cantu, "The Illusive Meaning of the Term Product under Section 402a of the Restatement (Second) of Torts," *44 Okla. L. Rev.* 635 (1991); Crystal L. Miller, "Goods/Services Dichotomy and the U.C.C.: Unweaving the Tangled Web," *59 Notre Dame L. Rev.* 717 (1984); Kerry M. L. Smith, "Suing the Provider of Computer Software: How Courts Are Applying U.C.C. Article Two, Strict Tort Liability, and Professional Malpractice," *24 Willamette L. Rev.* 743 (1988).

²³ See Chadwick L. Williams, "Not So Good: The Classification of Smart Goods under Ucc Article 2," *34 Ga. St. U. L. Rev.* 453 (2018).; For the discussions on the revised Article 2 UCC see Lee Kissman, "Revised Article 2 and Mixed Goods/Information Transactions," *44 Santa Clara L. Rev.* 561 (2004).; Henry Gabriel, "Uniform Commercial Code Article Two Revisions: The View of the Trenches," *23 Barry L. Rev.* 129 (2018).

²⁴ *Triangle Underwriters, Inc. V. Honeywell, Inc*, 604 F.2d 737 (2nd Cir. 1979); *Chatlos Systems, Inc. V. National Cash Register Corp*, 635 F.2d 1081 (3rd Cir. 1979); *Rrx Industries, Inc. V. Lab-Con, Inc*, 772 F.2d 543, (9th Cir. 1985); *Data Processing Servs. Inc V L.H. Smith Oil Corp.*, 492 N.E.2d 314, (Ind. Ct. App. 1986); *Stenograph Corp. V. Microcat Corp.*, 1990 WL 146754, (Ill. 1987); *Analysts Intern. Corp. V. Recycled Paper Products, Inc*, 1987 WL 12917, (Ill. 1987); *Communications Groups V Warner Communications*, 138 Misc.2d 80, (NYS 1988); *Micro-Managers, Inc. V. Gregory*, 147 Wis.2d 500, (Wis.Ct.App. 1988); *Advent Systems Ltd. V. Unisys Corp*, 925 F.2d 670, (3rd Cir. 1991); *Colonial Life Ins. Co. Of America V. Electronic Data Systems Corp*, 817 F.Supp. 235 (N.H. 1993); *Architectronics, Inc. V. Control Systems, Inc*, 935 F.Supp. 425 (SD N.Y 1996); *Micro Data Base Systems, Inc. V. Dharma Systems, Inc*, 148 F.3d 649, (7th Cir. 1998); *Newcourt Financial USA, Inc. V. Ft Mortg. Companies*, 161 F.Supp.2d 894 Inc, (ND Ill. 2001); *Multi-Tech Systems, Inc. V. Floreat, Inc*, 2002 WL 432016, (D.C.Min. 2002); *Epresence, Inc. V. Evolve Software, Inc*, 190 F.Supp.2d 159 (D. Mass. 2002); *Pearl Investments, Llc V. Standard I/O, Inc*, 257 F.Supp.2d 326, (D. Mai.2003); *Dealer Management Systems, Inc. V. Design Automotive Group, Inc*, 355 Ill.App.3d 416, (Ill.App. 2005); *Wachter Management Co. V. Dexter & Chaney, Inc*, 144 P.3d 747, (Kan. 2006); *Conwell V. Gray Loon Outdoor Marketing Group, Inc*, 906 N.E.2d 805 (Ind. 2009); *Surplus.Com, Inc. V. Oracle Corp*, 2010 WL 5419075 (ND Ill. 2010).

software and hardware. What started as a mere “good” in the 1970s ended up 40 years later being considered as goods or product whose value, however, lies exclusively in the services it provides.

Predominant Factor Test and software

The Predominant Factor Test or Predominant Purpose Test was crystallized in *Bonebrake v. Cox*²⁵, where it was held that:

“[Test] for inclusion or exclusion from coverage under Uniform Commercial Code of contracts for mixed goods or services is not whether contracts are mixed, but, granting that they are mixed, whether their predominant factor, their thrust, their purpose, reasonably stated, is rendition of service, with goods incidentally involved, or is transaction of sale, with labor incidentally involved”.

There is nothing really complicated about this test. In fact, it is a rather simplistic approach which is founded on the condition that a transaction is “mixed” for it involves both “goods” and “services”. Although each court developed its own justification on what it could be considered as “the main purpose of the transaction”, some elements have been solidified in *BMC Indus. v. Barth Indus.*²⁶ :

“First, the language of the contract itself provides insight into whether the parties believed the goods or services were the more important element of their agreement. Contractual language that refers to the transaction as a “purchase,” for example, or identifies the parties as the “buyer” and “seller,” indicates that the transaction is for goods rather than services.... Courts also examine the manner in which the transaction was billed; when the contract price does not include the cost of services or the charge for goods exceeds that for services, the contract is more likely to be for goods.... Movable goods is another hallmark of a contract for goods rather than services. The UCC's definition of goods makes clear the importance of mobility in determining whether a contract is for goods”

²⁵ *Bonebrake V. Cox*, 499 F.2d 951 (8th Cir. 1974).

²⁶ *Bmc Industries, Inc. V. Barth Industries, Inc*, 160 F.3d 1322, (11th Cir. 1998).

Contractual language, price allocations and movability were considered the “game changers” for the classification of a certain hybrid transaction. How could these elements be transferred to computer software cases?

The primary incidental services

In *Chatlos Systems v. National Cash Register*²⁷ (1979) a buyer of a computer system, which proved to be inoperable in large part, filed suit against the seller for breach of contract, breach of express and implied warranties, and for fraudulent misrepresentations. The court found that:

“Sale by defendant to plaintiff, through a leasing arrangement, of computer hardware and software involved a “sale of goods,” notwithstanding the incidental service aspect and the lease arrangement, and therefore the sales article of the Uniform Commercial Code was applicable”.

Accordingly, in *Triangle Underwriters v. Honeywell*²⁸ (1979), in a case involving a computer system installed by defendants and failed entirely of performance, causing great damage to the plaintiff, the court found that:

“Where buyer bought computer system from seller in the hope that the system would outperform the buyer's existing equipment, the contract was, as a matter of law, a contract for sale of goods, for statute of limitations purposes, even though certain services by the seller were contemplated”

Similar was the outcome of the *RRX Industries v. Lab-Con*²⁹ (1985) where it was stated that:

“the sales aspect of the transaction predominates. The employee training, repair services, and system upgrading were incidental to sale of the software package and did not defeat characterization of the system as a good”.

These cases, having been the first to transfer the generally applicable *Predominant Factor Test* to computer software illustrate two noteworthy remarks. The first is related to what judges perceived as

²⁷ See *Chatlos Systems v. National Cash Register* *supra* note 23

²⁸ See *Triangle Underwriters v. Honeywell* *supra* note 23

²⁹ *Id.* *RRX Industries v. Lab-Con*

“services” provided within the software’s contractual framework. A closer look at the cases shows that the only services mentioned in their text concern the “*installation and training period*”³⁰ as well as the “*employee training, repair services and system upgrading*”³¹ of the software. There is still no reference to the *ex ante* development process of the software embedded into the computer systems despite the fact that the computer systems in questions were indeed developed as part of the agreement³². Secondly, the common ground of all the aforementioned contracts was the massive hardware they involved (computers, servers, printers, collators and related equipment). Before the advent of the personal computer, the software was provided with a large computer system, often without additional charge. These cases held that the total transaction was within the ambit of the UCC, a result that made little difference because the complaints were invariably about the hardware, not the software³³. These cases were decided in a time when software was tightly bundled in what are called “turnkey” systems: an integrated hardware and software package that was supposed to work together as a whole³⁴. So what would happen if we took this element out of the equation?

Development process as a “service”

*Data Processing Services v. L.H. Smith Oil Corp*³⁵(1986) is one widely cited decision in computer law. In *Data Processing* the *Predominant Purpose Test* was adopted in its simplest form:

“Test to determine whether sales article of uniform commercial code, rather than common law, covers transaction is whether transaction involves actual goods defined as movable things at time of identification to contract and is not whether “dominant thrust” of transaction is sale of goods[...]Contract for development and delivery of computer program was not sale of “goods,” but was contract for computer programmer's skills and knowledge in developing

³⁰ *Id. Triangle Underwriters, Inc. V. Honeywell, Inc.*(“The agreement with Honeywell did not contemplate that it would run a data processing service for Triangle but rather that Honeywell would develop a completed system and deliver it ‘turn-key’ to Triangle to operate. After the installation and training period, Honeywell personnel were to withdraw, and Honeywell's major remaining obligation was to be maintenance”)

³¹ *Id. Rrx Industries, Inc. V. Lab-Con, Inc.*(“Here, the sales aspect of the transaction predominates. The employee training, repair services, and system upgrading were incidental to sale of the software package and did not defeat characterization of the system as a good”)

³² *Id.*

³³ Lorin Brennan, “Why Article 2 Cannot Apply to Software Transactions,” 38 *Duq. L. Rev.* 459 (2000).

³⁴ *Id.*

³⁵ See *Data Processing Services v. L.H. Smith Oil Corp supra* note 23

program, even though end result was to be preserved by means of magnetic tape, floppy disk, or hard disk”.

The court thus introduced the *Gravamen Test*³⁶ which in the first place maintains the “weighting method” for proving which aspect predominates. However, instead of comparing the “dominance” of either the “good” or the “service” aspect, the test is making a step back and approaches the transaction holistically in order to portray its “essence”³⁷. By featuring the “service” aspect of the transaction the court made another remarkable assertion. As *Balman* argues, this case represents an early and very brief trend in which courts applied a computer malpractice standard, essentially an elevated duty of care³⁸.

One major factor that triggered this shift in *Data Processing* was the acknowledgement that “services” within the contractual framework of computer software could extend beyond the common tasks of “installation”, “maintenance” or “employee’s training”. It would be helpful to further quote here these supplementary aspects of services that judges took into account in *Data Processing* when distinguished them from “hardware”:

The transaction here is clear-cut. Unlike many of the cases reported in other jurisdictions, DPS sold no “hardware” to Smith. Instead, DPS was retained to design, develop and implement an electronic data processing system to meet Smith's specific needs. We intentionally stress the active nature of DPS's role”.

Hence the “design”, “development” and “implementation” of a software are not only recognized as services provided by the “manufacturer” of a product but they end up being proclaimed as the principal *rationale*, the “essence” of the transaction albeit the

³⁶ See *Cantu Charles E. supra* 22 citing that: The court in *Anthony Pools v. Sheehan* argued that the predominant factor test should be modified to a "gravamen" test. The court quoted Hawkland's treatise on the Uniform Commercial Code:

Unless uniformity would be impaired thereby, it might be more sensible and facilitate administration, at least in this grey area, to abandon the "predominant factor" test and focus instead on whether the gravamen of the action involves goods or services. For example, in *Worrell v. Barnes*, if the gas escaped because of a defective fitting or connector, the case might be characterized as one involving the sale of goods. On the other hand, if the gas escaped because of poor work by Barnes the case might be characterized as one involving services, outside the scope of the U.C.C

³⁷ See *Chadwick W. supra* note 22

³⁸ Donald R Ballman, "Software Tort: Evaluating Software Harm by Duty of Function and Form," *3 Conn. Ins. L.J.* 417 (1996).

existence of a tangible medium in which these “services” are stored. However, this outcome was not a genuine victory of “services” over “goods”. Contrariwise, the court’s reference to the absence of “hardware” implies the effect of the prior decisions not only to *Data Processing* but to the whole jurisprudence to be presented³⁹. The “hardware” (usually large computer systems) that were regarded as “dominant purpose” for previous transactions had been shrunk in size and, subsequently, in dominance by giving its place to “floppy disks and CDs”. It was this decrease, and not the undisputed value of the supplied services, that led the court to decide over the nature of the contract. Hence, in broader terms, what this case demonstrates is an illustrative comparison between the evolution of technology and the progress of law⁴⁰. Nevertheless, this does not diminish the importance of the acknowledgement that services of software development are potentially the main *rationale* within the contractual framework. Equally in *Micro-Managers Inc. v. Gregory*⁴¹ the fact that the terms “development” and “design” had been included in the contract shifted the balance towards the inapplicability of UCC.

However, this outcome was not consolidated to a general rule. On the contrary, the following cases found the contract to be “sale of goods” despite the existence of a prolonged development process. In *Analysts International v. Recycled Paper Products*⁴² (1987), it was held that:

“Because no “off the shelf” software was adequate, AIC was expected to do a great deal of work, to be sure, but that work was to result in the production of a computer program. To call that work “service,” implying that it was service rendered to RPP, is to beg the question.

³⁹ See *supra* note 35

⁴⁰ *Id.* Lori Brennan describes it aptly:

“To be fair, judges are not appointed to indulge in metaphysical musings, but to decide cases. Litigants want answers, not theories, and want them now. To get the job done, busy judges often seize instinctively the tools they know. If that means a short glance at well known UCC that might be twisted to fit, as opposed to an expedition through scattered case law, which one will a harried judge choose? The problem with these cases is not so much their result as their reasoning, and the precedent it sets. Today’s emergency may justify using a hammer to drive in a screw, but that does not make this a fitting technique tomorrow. To assume it does is gives full reign to Cantor’s law of the conservation of ignorance. These cases, more than anything else, demonstrate why we need a new uniform law like UCITA, to provide guidance about how to properly deal with software transactions”.

⁴¹ See *Micro-Managers, Inc V. Gregory supra* note 23

⁴² *Id.* *Analysts International v. Recycled Paper Products*

Any supplier of a specially designed item must necessarily perform whatever work is required to create or produce the item. But this does not make the undertaking a “service” to the purchaser of the item. AIC itself has admitted that “the end product of [our] services has almost always been an operating computer program or software system designed to conform to the requirements of each specific client”

Likewise, in *Colonial Life Ins. V. Electronic Data Systems Corporation*⁴³ (1993) the court defied “four years of developing and customizing” and held that:

“Although the Agreement did contemplate many years of servicing, the purpose or thrust of these services was support of EDS' product, the Insurance Machine, in accommodating Chubb's business practices. The essence of the contract was to license Chubb to use a computer software product. Computer software has been held to fall within the definition of a “good” under the Code”.

Relatedly in *Micro Data Base Systems v. Dharma Systems*⁴⁴ (1998) the court found that:

“Although the contract recites that half the total contract price is for Dharma's “professional services,” these were not services to be rendered to MDDBS but merely the labor to be expended by Dharma in the “manufacture” of the “good” from existing software. It's no different than if MDDBS were buying an automobile from Dharma, and Dharma invoiced MDDBS \$20,000 for the car and \$1,000 for labor involved in customizing it for MDDBS's special needs. It would still be the sale of a good within the meaning of the UCC. We doubt that it should even be called a “hybrid” sale, for this would imply that every sale of goods is actually a hybrid sale, since labor is a service and

⁴³ *Id. Colonial Life Ins. V. Electronic Data Systems Corporation*

⁴⁴ *Id. Micro Data Base Systems v. Dharma Systems*

labor is an input into the manufacture of every good”

Compared to the group of the first three cases mentioned above, it could be argued that after *Data Processing* legal community made one step forward followed by one step back just to return to the point it started. Although they all agreed on the importance of the development process and signified that “development equals service” they did not manage to escape the conceptual barrier of tangibility. As we mentioned above, even the judges in *Data Processing* would seem inclined to reach the opposite result if they dealt with software installed in massive hardware instead of tiny floppy disks or CDs⁴⁵. Just like their precedent, courts denying the outcome in *Data Processing* focused on the product of the development process, the outcome to which every other service is ancillary. An argument used to solidify this thesis was the distinction between computer programs and computer software. In this context, computer programs were considered as a “product of an intellectual process but once implanted in a medium are widely distributed to computer owners⁴⁶” while computer software as “a tangible and movable item, not merely an intangible idea or thought”⁴⁷. Under this reasoning, although the large computer system was followed by a small *medium* which in turn gave its place to the software license, legal treatment remained unchanged. Hence at that point in time, software development was nothing more than an incidental service aiming at the “manufacture of the good”⁴⁸.

A product made of services

The undoubted dominance of the medium in cases involving computer software started losing ground after 2000. Although it was not denied that the existence of a medium will most probably render the transaction a “sale of goods”, some courts began looking at the broader picture. Building on the argumentation in *Architectronics v. Control Systems*⁴⁹ the court in *Multi-tech Systems v. Floreat*⁵⁰ presented a remarkable argument:

⁴⁵ *Id. Data Processing Servs. Inc V L.H. Smith Oil Corp.* (“The transaction here is clear-cut. Unlike many of the cases reported in other jurisdictions, DPS sold no “hardware” to Smith. Instead, DPS was retained to design, develop and implement an electronic data processing system to meet Smith's specific needs”)

⁴⁶ See *Advent Systems Ltd. V. Unisys Corp. supra* 23. For a detailed critic on this definition see *Brennan supra* 35 (on the definition of computer program author eloquently states: “This remarkable statement has the unique quality of being wrong on every point it makes”).

⁴⁷ See *Communications Groups V Warner Communications. supra* note 23

⁴⁸ See *Id. Micro Data Base Systems, Inc. V. Dharma Systems, Inc.*

⁴⁹ See *Architectronics, Inc. V. Control Systems, Inc. supra* note 23 (“That license was the centerpiece of the transaction, because it provided Architectronics and CADSource with the valuable right to manufacture the new display driver and sell it to the public. Architectronics and CADSource bargained primarily for the right to

“The 1995 Contract similarly refers to “the hardware and software design and development” [...] did not result in a marketable product. This language and course of dealing suggests that Multi-Tech did not pay Floreat for the sale of software but rather for Floreat's contribution of knowledge and expertise to the design and development of a product that included a software component. The few cases considering the question indicate that the UCC does not apply to an agreement to design and develop a product, even if compensation under that agreement is based in part on later sales of that product. See, e.g., *Architectronics, Inc. v. Control Sys., Inc.*, 935 F.Supp. 425, 432 (S.D.N.Y.1996)”.

In this paper, we argue that *Multi-tech Systems* has not received adequate attention by judges and academia. A comparison of *Multi-tech Systems*'s argumentation to *Data Processing* reveals the new step that was about to be made should the former's reasoning had been processed thoroughly. In *Data Processing* what judges evaluated when searching for the Predominant Purpose of the contract at issue was “the means of some physical manifestation such as magnetic tape, floppy or hard disks which would generate the recordkeeping computer functions”⁵¹. Conversely, in *Multi-tech Systems* the court circumvented the tangibility discussion⁵² and regarded software as a component of the final product that resulted from the supplied services. Subsequently, the court found that the reason why parties contracted was the “knowledge and expertise to the development of a product”. Although this may seem like a minor difference at the first

mass-market the product, not for the right to install single copies of the display driver onto their own PCs[...]Because the predominant feature of the SDLA was a transfer of intellectual property rights, the agreement is not subject to Article Two of the UCC”.)

⁵⁰ See *Multi-tech Systems v. Floreat supra* note 23

⁵¹ See *supra* note 48 (“Although the end result was to be preserved by means of some physical manifestation such as magnetic tape, floppy or hard disks, etc., which would generate the recordkeeping computer functions DPS was to develop, it was DPS's knowledge, skill, and ability for which Smith bargained. The sale of computer hardware or generally-available standardized software was not here involved”)

⁵² See *Multi-Tech Systems, Inc. V. Floreat, Inc. supra* note 23 (“Any software in a tangible medium that Floreat provided to Multi-Tech pursuant to the 1992 and 1995 Contracts at best was incidental to the predominant purpose of those agreements, which was to develop and improve the MultiExpress PCS and MultiModem PCS product. Contribution of knowledge and expertise to the development of a product is not “goods” within the meaning of the UCC, and the 1992 and 1995 Contracts accordingly are not subject to the UCC”)

place it is, in fact, a shift with potentially significant implications. *Multi-tech Systems's* argumentation acknowledges the existence of software as a product, supplementary –and not determinative- to the services for the development of the latter, and considers it to be a “component” rather than the end-good to be manufactured. It then proceeds to recognize a broader essence for the agreement “which was to develop and improve the MultiExpress PCS and MultiModem PCS product” and, with this point, reaches the conclusion that the predominant purpose of the agreement was the “[t]he contribution of knowledge and expertise to the development of a product”.

Let's open parenthesis and return back to our initial example. The contract between school administration and the developer involves the development of smart-software for access control. The school administration would not be satisfied with mere automation of its entrance system. It would contract only for a system fully autonomous in judging potential security threats. The director's goal was to significantly enhance its “product”. For this reason, it contracted with our developer who is specialized in smart-software development. If we adopted *Multi-tech Systems's* argumentation we would argue that the smart-software installed into and functioning within our smart-system is a component product –tangible or not- in an entirety of supplied services which in turn were agreed upon due to our developer's knowledge and expertise. On the contrary, if we followed the argumentation in *Dharma* the smart-software along with its accompanying revolving door would be considered the end-“goods” at which the “manufacturing” services were aiming. As a result, the *Multi-tech Systems's* court would have found for the “services” aspect whereas *Dharma's* for the “goods”.

Unfortunately, though, *Multi-tech Systems's* reasoning was not solidified further. It could be argued that this is mainly because of a wrong implementation of the *Multi-tech Systems* in following *Pearl Investments v. Standard I/O*⁵³. Although the outcome of the case is similar to that of *Multi-tech Systems*, the conclusion is based on the wrong assumption that:

“development of a software system from scratch
primarily constitutes a service”

This statement in the original text is followed by a citation in the *Multi-tech Systems's* points in the discussion. However, this is far from what *Multi-tech Systems* wanted to imply. Indeed, the computer software in *Multi-tech Systems* was made from scratch but the adopted argumentation if properly analyzed can be easily applied to a case that involves either the development and/or the customization of a computer software. Unfortunately, in at least one case that followed *Pearl* (the *Dealer Management Systems v. Design Automotive*) the

⁵³ See *Pearl Investments v. Standard I/O* *supra* note 23

court perpetuated this wrong assumption and by citing the *Pearl* –and not the *Multi-tech Systems* - found that:

“there is nothing in plaintiff’s complaint or in the purchase order itself to suggest that these components were developed from scratch ... Customization may be treated as “the ‘manufacture’ of the ‘good’ from existing software” rather than as a service”.

A product made for services

In *Conwell v. Gray Loon Outdoor Marketing Group*⁵⁴, the court after aptly pointing out that “when courts try to pour new wine into old legal bottles, we sometimes miss the nuances” held that:

A website created under arrangements calling for the designer to fashion, program, and host its operation on the designer’s server is neither tangible nor moveable in the conventional sense. To be sure, one can copy a website using tangible, movable objects such as hard drives, cables, and disks. These objects are in themselves just as certainly goods, but it does not necessarily follow that the information they contain classifies as goods as well. The arrangement between POA and Gray Loon contemplated a custom design for a single customer and an ongoing hosting relationship. As such, conventional “predominant thrust” doctrine suggests that the U.C.C. did not apply.

The wording in *Conwell* matters to our analysis. The “as such” in the last sentence quoted above, refers to three elements that led the judges to declare that the transaction in question is not “sale of goods” but “supply of services” and thus UCC does not apply. These elements are 1) the custom design 2) the single customer and 3) the ongoing hosting relationship. Although we have encountered the first and the second in previous cases the third one has an interesting history. In 1979 and the *Triangle Underwriters* case, the plaintiff argued that since the defendant personnel continued to work on the plaintiff’s premises “it is entirely possible that negligence occurred at a time within three years of the institution of the suit”. The Second Circuit did not “buy” and refused to apply the continuous treatment

⁵⁴ *Id. Conwell v. Gray Loon Outdoor Marketing Group*

concept⁵⁵. Thirty years later, the Supreme Court of Indiana in *Conwell* argued that the *ex post* ongoing relationship that is maintained –in our case through the hosting of a website in a server- is not only considered to be a “service” but it is, in fact, one of the main *rationales* of the agreement. This argument, along with the comments on *Multi- tech Systems*, is potentially useful pillars for future UCC litigation that will involve software.

With this in mind, the gist of the above jurisprudential review can be delineated in two claims:

1. The smart-software and the item into which it is incorporated could be considered as either the “end-product” at which all supplied services are aiming or a component product in an entirety of supplied services which the recipient requested by taking into account the provider’s knowledge and expertise. In the first case, the transaction will be “sale of goods” while in the second case it will be “supply of services”.
2. The maintenance of the connection between the parties and the details of their ongoing relationship could be a “service” by itself and affect the nature of the whole transaction.

The aim of the abovementioned “test” is not to offer a clear-cut answer to the questions of whether smart-software is generally “goods” or “services”. A definitive all-in-one approach is not possible. However, a pattern of thinking for judicial certainty without departing from the already established norms and principles⁵⁶ is feasible. The twofold assertion shapes the ambit of responsibility of the contractual parties in a more contemporary way. Instead of seeking for the predominant purpose of the transaction, it acknowledges two chronologically and spatially distinct stages of examination. One that runs from the past (development/customization) to the present (delivery of computer software) and from the physical to the digital world by focusing on the nature of the development procedure; and one that covers the services provided at the same “space” but only at the *ex post* stage. If the latter services are substantial then it is likely that the transaction is one of services whereas if the *ex post* relationship is limited to the “basics” then the nature of the transaction will depend on its “essence”⁵⁷.

⁵⁵Id. *Triangle Underwriters, Inc. V. Honeywell* (“The “continuous treatment” concept, initially applied to medical malpractice actions, could not be extended to embrace claims against manufacturer of machinery where it was never contemplated that the manufacturer would undertake the continuous running of the machinery for the buyer”.)

⁵⁶See generally Kissman *supra* 22

Tort liability

Six months of consultation and medication. Emotional distress caused to both Herianna and Carol. A missed job and a week away from school. Plus all the above harms were suffered due to an actor whose performance paradoxically does not constitute a strict sensu breach of contract.

The first step towards establishing the correct legal foundations for our developer's potential liability is to deal with the question of whether smart-software is a product⁵⁸. If it is, then Product Liability Rules will apply. If not, then liability will be based upon the existence of a duty of care that has been breached by the wronged since "It is axiomatic that there can be no tort liability unless [a] defendant owed a duty to [a] plaintiff"⁵⁹. The present analysis supports that no matter the classification of a smart-system, the judgement on the liability arising from its "activity" will inevitably be based on common law rules of negligence. For this reason, the argumentation will proceed conditionally by examining firstly the "product" and subsequently the "services" case.

If smart system is a product

The current problem of whether smart-systems are products – and the subsequent calls for the need for homogeneity- emanates from the definitional differences between what is "product" and what is "goods". Contrary to the definition of "goods"⁶⁰ the Restatement (Third)

⁵⁷ An example here may be illustrated. A bank contracts with a company for the development of a credit-risk assessment tool. The company agrees to develop and maintain a database safe from cyber-attacks and supplied with up-to-date information in order to sustain an efficient decision-making system. In this example the commitment of the bank is neither just to deliver a computer system nor to deliver and technically maintain it. On the contrary the "essence" of the agreement lies in the desire of the bank to acquire the capacity to achieve accurate decisions anytime. Hence, the transaction is "supply of services". This would not be so easy to define though, should the company has asked for a computer system for internal communications. In such a case the ex post commitment will probably be limited to "bug-fixing" which would not be sufficient to cement the "ongoing relationship". Thus we would return to our first claim in order examine the "essence" of our transaction.

⁵⁸ This question should not confuse the reader. Whether something is considered as a "product" for the purposes of tort law is distinct from whether it was supplied as "goods" or "services". Although every "good" is a "product", this does not mean that a contract for services could not include products. For example, think of a hairdresser that puts an infectious gel on your hair after washing. The mere fact that the product was supplied within a contract for services does not diminish its character as "product" for the purposes of product liability rules.

⁵⁹ *Fultz V. Union-Commerce Associates*, 470 Mich. 460 (Mich. 2004).

⁶⁰ UCC § 2-105:

(1) "Goods" means all things (including specially manufactured goods) which are movable at the time of

of Torts [hereinafter *Third Restatement*] seems to add another element which could end up becoming the crux of the cases involving defective computer software. The prerequisite of tangibility:

“(a) A product is tangible personal property distributed commercially for use or consumption. Other items, such as real property and electricity, are products when the context of their distribution and use is sufficiently analogous to the distribution and use of tangible personal property that it is appropriate to apply the rules stated in this Restatement”.

A more systematic view on the definition renders it much less rigid. The second sentence, structured as opposing to the tangible items described in the first sentence, speaks of “other items” that “are products when the context of their distribution [...]is sufficiently analogous...” Hence, for these “other items”, tangibility is not regarded as a *sine qua non* condition for the application of Product Liability Rules⁶¹ and it is for the court to determine whether something is, or is not a product.

Especially when compared against Section 402A of the Second Restatement, the Third Restatement appears receptive to the treatment of computer software as a product⁶². The “tangibility” prerequisite was not included in prior Restatements. Indeed, the Second Restatement of Torts by setting the notion of “product” in a vague yet indicative framework, relied on the judges to determine what it is covered under it and what not⁶³. For this reason, early after the adoption of the *Third Restatement*, *Lanetti* persuasively argues that: “the definition provided in the new *Restatement* is more detailed than that in its predecessor, it is unnecessarily restrictive, is ill-suited for application to emerging technologies, and does little to harmonize products liability and sales law”⁶⁴. For this reason, an adaptive definition of “product” would embrace the notion of “goods” and reconcile any inconsistencies in products liability and sales law by

identification to the contract for sale other than the money in which the price is to be paid, investment securities (Article 8) and things in action. “Goods” also includes the unborn young of animals and growing crops and other identified things attached to realty as described in the section on goods to be severed from realty (Section 2-107).

⁶¹ See David Berke, “Products Liability in the Sharing Economy,” *33 Yale J. on Reg.* 603 (2016).

⁶² *Id.*

⁶³ See *supra* 11 (“This evolutionary approach, with its reliance on judicial interpretations, has proved integral to the development of tort law over the past century. Technological advances demand a flexible approach to tort recovery, despite the burden such an approach might impose upon the courts”)

⁶⁴ *Id.*

equating products and UCC goods. A detailed discussion on the tangibility prerequisite remains out of the scope of this paper since it does not affect the analysis. Suffices it to echo *Reutiman's*⁶⁵ argumentation who supports that: “courts must address whether the tangible-intangible distinction is truly a desirable method for determining the scope of products liability. The muddled reasoning and conflicting results found in the decisions involving books, aeronautical charts, video games, and computer software demonstrate that the tangible-intangible test cannot sufficiently allocate information-derived liability. Courts, therefore, should abandon the tangibility concept as it is not conducive to consistent or intellectually coherent results”.

The defect

Assuming *arguendo* that our court, manages to overcome the conceptual barriers set by the service-like nature of the smart-software and by affirming -or fundamentally ignoring- the tangibility prerequisite finds that the smart-software of our case should be treated as product for the purposes of Product Liability Rules.

Application of Product Liability Rules does not and should not be understood *per se* as an application of strict liability rules⁶⁶. Equally, strict liability should not be confused with absolute liability⁶⁷. The *Third Restatement* defines three different types of defects that can occur to a product. These are the manufacturing defect, the design defect and the warning defect⁶⁸. This threefold distinction makes clear that not all the defects are equal. For the purposes of the current analysis, we will focus on the first two types of defects.

⁶⁵ See *supra* 12

⁶⁶ See W. Bradley Wendel, "Economic Rationality and Ethical Values in Design-Defect Analysis: The Trolley Problem and Autonomous Vehicles," 55 *Cal. W. L. Rev.* 129 (2018) (“Liability under Section 402A required a finding that the car was in a “defective condition unreasonably dangerous,” which is not strict liability at all, but a kind of crypto-negligence standard”).

⁶⁷ See *Woodill V. Parke Davis & Co.*, (1980). (“Strict liability is not the equivalent of absolute liability. There are restrictions imposed upon it. For example, we have previously held that where an injury is not foreseeable, that is, objectively predictable, no liability will ensue based on strict liability. (*Winnett v. Winnett* (1974), 57 Ill.2d 7, 12-13, 310 N.E.2d 1.) Also, where the plaintiff knows of the risk of injury presented by the use of a dangerously defective product but assumes the risk nonetheless, the manufacturer is absolved from liability”).

⁶⁸ According to § 2 of the Third Restatement:

“A product is defective when, at the time of sale or distribution, it contains a manufacturing defect, is defective in design, or is defective because of inadequate instructions or warnings. A product:

- (a) Contains a manufacturing defect when the product departs from its intended design even though all possible care was exercised in the preparation and marketing of the product;
- (b) is defective in design when the foreseeable risks of harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design by the seller or other distributor, or a predecessor in the commercial chain of distribution, and the omission of the alternative design renders the product not reasonably safe;

A manufacturing defect occurs when a product departs from its intended design, fails and causes harm to the plaintiff. The use of the words “*even though all possible care was exercised*” is precisely what strict liability rules are meant to deliver, meaning the ascription of liability without the burden of proving fault⁶⁹.

In contrast to manufacturing defects, design defects and defects based on inadequate instructions or warnings are predicated on a different concept of responsibility. Contrary to the clear language used in 2(a), a product is defective in design when “*the foreseeable risks of harm posed by the product could have been reduced or avoided by the adoption of a reasonable alternative design*”. In such a claim, what a plaintiff is targeting at is not the deviation of the product from the manufacturer’s initial design but the initial design itself and whether a reasonable manufacturer or designer would have chosen it⁷⁰.

The scope of this distinction is clear. Contrary to the manufacturing defects which implicate an unorthodox irregularity in an established and supposedly error-free production chain, design defect points at the designer’s righteousness, her sequence of personal choices with regards to the entire product. This distinction is pivotal for the way the law treats the different defects. Owen⁷¹, who has coined the term “reasonable balance”⁷² in order to encompass the idea of design defect, describes: “In holding manufacturers responsible for defects in design, courts and commentators have always sought to avoid absolute liability, recognizing that the concepts of design safety and design danger are matters of degree involving trade-offs between a product’s usefulness, cost, and safety”.

Today, it is likely that the development process of a smart-software will include procedures that could not easily fit under the

(c) is defective because of inadequate instructions or warnings when the foreseeable risks of harm posed by the product could have been reduced or avoided by the provision of reasonable instructions or warnings by the seller or other distributor, or a predecessor in the commercial chain of distribution, and the omission of the instructions or warnings renders the product not reasonably safe.”

⁶⁹ See comments at Restatement (Third) of Torts: Prod. Liab. § 2 (1998) (“The rule for manufacturing defects stated in Subsection (a) imposes liability whether or not the manufacturer’s quality control efforts satisfy standards of reasonableness”)

⁷⁰ *Id.* : “Whereas a manufacturing defect consists of a product unit’s failure to meet the manufacturer’s design specifications, a product asserted to have a defective design meets the manufacturer’s design specifications but raises the question whether the specifications themselves create unreasonable risks. Answering that question requires reference to a standard outside the specifications. Subsection (b) adopts a reasonableness (“risk-utility balancing”) test as the standard for judging the defectiveness of product designs”. The test is further analysed below

⁷¹ David G. Owen, Design Defects, 73 Mo. L. Rev. 291(2008)

⁷² David G. Owen, “Defectiveness Restated: Exploding the “Strict” ProductsLiability Myth”, U. ILL. L. REV. 743 (1996)

normative umbrella of the “manufacturing defect”⁷³. To put it differently, there is nothing within smart-software’s development procedure that could resemble the traditional downstream chain process for the manufacturing of an artefact. Although both a bottle of Coca-Cola and a smart-software are opaque articles in that you cannot actually peek inside to spot an error before you use them, their opaqueness blankets two diametrically different things. The way it has been manufactured for the former and the way it has been designed for the latter. A closer look into the architecture, the professions involved and the nature of their tasks in the development of a “smart- software” verify this argument.

Reflecting on our example we can visualize the following steps for the creation of our smart-software in dispute. At the beginning, the school administration met with the Chief Analytics Officer (CAO) of the company to discuss the potential of deploying smart-software in order to track and control the entry and exit of the students. One week later, after discussing with colleagues and putting things on paper, the CAO returns with a detailed plan based on the administration’s request. They shake hands and CAO launches the preparation of the smart-software. The first task is data collection and processing. During this phase, data scientists and data analysts are working on creating the “fuel” of their system by collecting, labelling and selecting their data. They agree in feeding their system with personal data of students and their close relatives, past data of their parents, current and past addresses and their social media profiles and statistics. After that, data scientists will check the complete dataset and parse it into three parts, the training, the test and the validation set. Every developer plans her own dataset-splitting and there is no rule -neither could be one- governing this part of the process. Once they have a refined and parsed dataset, data scientists examine which model provides the most accurate decisions and when they agree upon it, they gradually train it on the split datasets. At this stage, they evaluate the results of every “training session” and interfere with it by tuning its inclination in order to achieve precise outcomes. Once trained and tuned, the system is ready for deployment.

⁷³ See Seldon J. Childers, "Don't Stop the Music: No Strict Products Liability for Embedded Software," *19 U. Fla. J.L. & Pub. Pol'y* 125 (2008). (“therefore most injurious software defects will be of a design defect type”); but see Jacob Kreutzer, "Somebody Has to Pay: Products Liability for Spyware," *45 Am. Bus. L.J.* 61 (2008). (“Manufacturing defects would include the more obvious hardware malfunction due to faulty components, and may include typographical errors by programmers and even the inadvertent use of out of date research material in the construction of the CPGs”) and Peter A. Alces, "W(H)ither Warranty: The B(L)oom of Products Liability Theory in Cases of Deficient Software Design," *87 Cal L. Rev.* 269 (1999); Frances E Zollers et al., "No More Soft Landings for Software: Liability for Defects in an Industry That Has Come of Age," *21 Santa Clara Computer & High Tech. L.J.* 745 (2005). with however unpersuasive argumentation (“This distinction is supported by the fact that a “bug” in software can be corrected -much like a *manufacturing* defect-e.g., a cracked casing-can be corrected-, and the software would not have been *designed* to include the bug, the admitted deficiency)

Each step of the way involves a series of choices. Software design, data analysis and machine learning architecture all require a multitude of weight choices while coding itself is a substantially intellectual process. It is a journey to an ocean of available choices that requires checks, trade-offs, tests and cooperation. An engineering journey, where everything is assembled primarily according to coder's discretion. The final destination of this journey is the complete software, the computational ecosystem that is built and raised from the developers' trade-offs. As such, software will always be a combination of a complex and scalable design.

The test

Assuming, now, that our system's fault is indeed labelled as "design defect". Normally, the standard for judging a product's design defect is the *risk-utility test*⁷⁴. Built on the Hand Formula's legacy⁷⁵, the risk-utility test algebraically portrays that a product's design is defective if the safety benefits of an untaken design precaution foreseeably exceed its costs⁷⁶. Hence, the dominant factor of the equation is the availability and cost of an alternative design. This jurisprudentially developed and broadly accepted method, however, may not help our analysis. I delineate four reasons to support this argument.

Firstly, smart-systems do not have their design written in stone. They are constantly adapting their activity according to the data they receive. As a result, if judges want to be normatively correct, the alternative design criterion will need to set the standard according to the ex-post smart-system, the smart-system at the time of harm, which may very well include something that the initial developer has not designed⁷⁷. Secondly, in cases where the smart-system is an

⁷⁴ More specifically, the test is whether a reasonable alternative design would, at reasonable cost, have reduced the foreseeable risks of harm posed by the product and, if so, whether the omission of the alternative design by the seller or a predecessor in the distributive chain rendered the product not reasonably safe

⁷⁵ See chapter on "Causality"

⁷⁶ See Owen *supra* note 72; See also John W. Wade, "On the Nature of Strict Tort Liability for Products", 44 *Miss. L.J.* 825, 837-38 where author lists seven factors to weight when applying the risk-utility test ("lists seven factors to weigh in considering the risk-utility test: (1) The usefulness and desirability of the-product-it's utility to the user and to the public as a whole. (2) The safety aspects of the product-the likelihood that it will cause injury, and the probable seriousness of the injury. (3) The availability of a substitute product which would meet the same need and not be as unsafe. (4) The manufacturer's ability to eliminate the unsafe character of the product without impairing its usefulness or making it too expensive to maintain its utility. (5) The user's ability to avoid danger by the exercise of care in the use of the product. (6) The user's anticipated awareness of the dangers inherent in the product and their avoidability, because of general public knowledge of the obvious condition of the product, or of the existence of suitable warnings or instructions (7) The feasibility, on the part of the manufacturer, of spreading the loss by setting the price of the product or carrying liability insurance")

⁷⁷ See for example Alan Butler, "Products Liability and the Internet of (Insecure) Things: Should Manufacturers Be Liable for Damage Caused by Hacked Devices", 50 *U.Mich. J.L. Reform* 913 (2017) ("Unlike a Ford Pinto design that creates a risk of a gas tank explosion even in a minor traffic accident,95 an IoT device may not be vulnerable, even in retrospect, at the time that it is designed or sold. Security

expert system fueled with knowledge of a specific domain (e.g. a medical smart-system), the alternative design criterion will inevitably rely on the availability of an alternative “bunch of knowledge” that could have been deployed. As a result, the litigation will convert to a scientific battle of domain experts⁷⁸. Thirdly, the quest for an alternative design will surely be a hard and expensive evidentiary procedure that will require expert testimonies aspiring to demonstrate different arrangements of the codes and algorithms⁷⁹. Lastly, truth is that there will always be an alternative design. Indeed, the antidote to a system’s “bug” is a “bug-free” system. Admittedly, the validity of such an argument is attractive. Under the light of the current stage of computational technology, though, it seems to be –at least–questionable. Suffices it to say that the acceptance of this alluringly rational claim would be an implicit *imperatus* for the development of absolutely “bug-free” programs. Computer scientists agree however that there can be no such thing.

Emanating from this last assertion, *Brian Choi* has proposed the “crashworthy code” doctrine⁸⁰. By accepting the intrinsic fallibility of programming and by directly targeting the design rather than the end product or the harm occurred, *Choi* persuasively suggests that the adoption of the notion of “crashworthiness” will gradually cultivate a requirement for developers to build safer programs.

Another approach for the evaluation of a design defect that has been scarcely adopted by courts broadens the framework of the risk-utility test. In *Banks v. ICI Americas, Inc.*⁸¹ the court did not restrict itself in the mathematical boundaries of the risk-utility equation and held that:

“We recognize that in setting forth a test under the risk-utility analysis for the determination whether a manufacturer should be liable for an entire product line, no finite set of factors can be considered comprehensive or applicable under every factual circumstance, since such matters must necessarily vary according to the unique

researchers and hackers are constantly discovering new vulnerabilities, and these discoveries require software vendors to update their software on a regular basis

⁷⁸Christopher J. Gill, “Medical Expert Systems: Grappling with Issues of Liability”, *1 High Tech. L.J.* 483 (1986)(“Proof of alternative design options would have to concentrate upon the body of medical knowledge that comprises the system's operational rules. And, as stated above, substituting one set of health care principles for another will probably only serve to replace one group of risks with another.”)

⁷⁹ See Jeffrey K. Gurney, *Sue My Car Not Me: Products Liability and Accidents Involving Autonomous Vehicles*, 13 U. ILL. J.L. TECH. & POL'Y 247, Alexander F. Beale, *Who's Coffers Spill When Autonomous Cars Kill - A New Tort Theory for the Computer Code Road*, 27 *Widener Comm. L. Rev.* 215 (2018), 227 (2013).

⁸⁰ Bryan H. Choi, “Crashworthy Code”, *Washington Law Review* (2019)

⁸¹ *Banks v. ICI Americas, Inc.*, 264 Ga. 732, (Geor. 1994)

facts of each case. Such diverse matters as competing cost trade-offs, tactical market decisions, product development and research/testing demands, the idiosyncrasies of individual corporate management styles, and federal and other regulatory restrictions can enter into a consideration of the reasonableness of a manufacturer's decision-making process”.

Bank’s approach has been criticized by *Owen* as opening “the Pandora’s box” and providing little help due to its “wide and open-ended catalogue”⁸². However, in cases involving complex computational systems, the utility of a wider spectrum will benefit the plaintiff. Alternative design aside, the degree of human involvement within a smart-system as described above, cannot but fit in a broader spectrum. Elements such as “knowledge”, “state of the art”, “avoidability of danger” and “publicity surrounding the danger” are extremely important for judging the standard of care that a coder exercised⁸³. Narrowing the spectrum to a mere “risk and benefit” equation will deprive the plaintiff of an arsenal of useful claims to found her argumentation. Proving “reasonableness” will demand fewer resources than claiming the availability of a highly-technical alternative design. Equally, the burden of proof is likely to shift away from the shoulders of the defendant easier.

As a result of the above, if the court in our case decides that our system is “product” for the purposes of Product Liability Rules, our coder:

- 1) will be held to a negligent standard due to the system’s design defect and 2) the criterion will not be a strict “risk-utility test” but a broader judgement on the coder’s “reasonableness”⁸⁴.

⁸² See *Owen supra* note 72

⁸³ The court in *Banks* offered a non-exhaustive list of general factors that included among others:

(“the usefulness of the product; the gravity and severity of the danger posed by the design; the likelihood of that danger; the avoidability of the danger, i.e., the user's knowledge of the product, publicity surrounding the danger, or the efficacy of warnings, as well as common knowledge and the expectation of danger; the user's ability to avoid danger; the state of the art at the time the product is manufactured; the ability to eliminate danger without impairing the usefulness of the product or making it too expensive; and the feasibility of spreading the loss in the setting of the product's price or by purchasing insurance. We note that a manufacturer's proof of compliance with industry-wide practices, state of the art, or federal regulations does not eliminate conclusively its liability for its design of allegedly defective products”)

If smart software is service

Supposing now that the court in our case affirms that the contract was one of services, denies the classification of the smart-software as “product” and, subsequently, holds that the Product Liability Rules do not apply. For the sake of the discussion we consider the contract for educational services between Herianna on behalf of her daughter and the school administration to have been breached and as a result, the later already paid the contractually agreed amount of money. We will now focus on the extracontractual harm that Herianna and Carol suffered due to the defendants’ (school and coder) alleged misconduct. In order for such a claim to be established, plaintiffs will have to prove negligence on part of school administration and/or the developers. The issues of *whether* a duty exists and *what* this duty would look like is discussed in another chapter. The present chapter focuses on issues of “admissibility” and whether such a duty *could* exist. Two main challenges emerge. Firstly, the existence of a duty of care which although arising from a contractual agreement goes beyond this to cover third parties. And secondly, assuming that such a duty exists, whether coders could owe it.

Duty of care to non-parties

Somewhere in Massachusetts, in 1885, Mr Weber who was holding himself out to the public as a caterer, skilled in providing and preparing food for entertainments, was employed by the Bishop to furnish food and drinks for the purposes of a local festive. Unfortunately, some of the guests were injured due to the low quality of the catered food. At the trial that followed the accident, the plaintiff’s action was originally entitled “in an action of tort” and before proceedings commence, plaintiff obtained leave to amend by adding the words “or contract”. Apparently, he did not have to. Because the Supreme Judicial Court of Massachusetts held that:

“If one who holds himself out to the public as a caterer, skilled in providing and preparing food for entertainments, is employed as such by those who arrange for an entertainment, to furnish food and drink for all who may attend it, and if he undertakes to perform the services accordingly, he stands in such a relation of duty towards a person who lawfully attends the entertainment and partakes of the food furnished by him as to be liable to an action of tort for negligence in

⁸⁴ In such a case the plaintiff will shoulder the burden of proof, however issues of complexity may justify its reverse with the application of the *res ipsa loquitur* principle.

furnishing unwholesome food whereby such person is injured. The liability does not rest so much upon an implied contract as upon a violation or neglect of a duty voluntarily assumed. Indeed, where the guests are entertained without pay, it would be hard to establish an implied contract with each individual. The duty, however, arises from the relation of the caterer to the guests”.

Two years later, in the *Tuttle v. George H. Gilbert Mfg. Co*⁸⁵ case the rule was set in a sentence:

“As a general rule, there must be some active negligence or misfeasance to support tort. There must be some breach of duty distinct from breach of contract”.

This separate and distinct duty that goes beyond the contract, is “imposed by law” and could arise either by operation of a statute or under the basic rule of the common law, which imposes on every person engaged in the prosecution of any undertaking an obligation to use due care not to unreasonably endanger the person or property of others⁸⁶. As such the rule covers cases of personal injury and damage to property.

The *Clark v. Dalman*⁸⁷ case took this “separate and distinct” duty one step further. The court found that breach of a contract to repair, clean, and paint a water storage tank, also gives rise to an action in tort in favour of a non-contracting third-party. Premised on the same idea that every contract is a common-law duty to perform with ordinary care the thing agreed to be done, and that a negligent

⁸⁵ *Tuttle v. George H. Gilbert Mfg. Co*, 145 Mass. 169, (Mass. 1887)

⁸⁶ Prosser in his Thomas M. Cooley Lectures unravels the historical background of our present problem:

“For our purposes, the important fact is that it still remained possible, notwithstanding the existence of the new remedy, to maintain the old tort action on the case in any contract situation in which it had been recognized. Litigants were quite slow to adopt the practice of pleading in assumpsit where the older action would still lie. It was not until 1689 that it was first intimated that a carrier might be liable in contract. It was not until 1778 that assumpsit was held to lie for a seller's breach of warranty; and even then it appears to have been resorted to only for the procedural advantage of joining money counts to recover the price paid. The old tort remedy for breach of the undertaking involved in a warranty, without proof of an scienter or deceit, survives in a healthy condition even to the present day; and there are a great many American cases in which it has been successfully maintained”.

⁸⁷ See *Clark V. Dalman*, 379 Mich. 251 (Mich. 1967). This was not the first case to acknowledge a duty to an extracontractual third-party but it was chosen due to its detailed argumentation. *Clark V. Dalman*, 379 Mich. 251 (Mich. 1967).

performance constitutes a tort as well as a breach of contract, the court proceeded by requiring that this specific duty of care is not limited to the contractual boundaries but is owed either specifically to the plaintiff or to a group of which the plaintiff is a part⁸⁸. However, *In re Certified Question from Fourteenth Dist. Court of Appeals of Texas*⁸⁹, the Supreme Court of Michigan, confronted Clark’s argumentation and after heated judicial debate –with, admittedly, interesting to read dissenting opinions⁹⁰– set two major restrictions on this “general duty”. The existence of a relationship between the parties and the foreseeability of the harm. Despite the differences among jurisdictions though, they all seem to agree that the ultimate inquiry in determining whether a legal duty will eventually be imposed is public policy and whether the social benefits of imposing a duty outweigh the social costs of it. This principle is an articulation of the foundation pillar of the duty of care as expressed by *Prosser*:

“[D]uty is not sacrosanct in itself, but is only
an expression of the sum total of those

⁸⁸ *Id.* (“Chief Justice (then Justice) T. M. Kavanagh explained this relationship of a tort action to the underlying contract: ‘Actionable negligence presupposes the existence of a legal relationship between parties by which the injured party is owed a duty by the other, and such duty must be imposed by law [...]Such duty of care may be a specific duty owing to the plaintiff by the defendant, or it may be a general one owed by the defendant to the public, of which the plaintiff is a part. Moreover, while this duty of care, as an essential element of actionable negligence, arises by operation of law, it may and frequently does arise out of a contractual relationship, the theory being that accompanying every contract is a common-law duty to perform with ordinary care the thing agreed to be done, and that a negligent performance constitutes a tort as well as a breach of contract. But it must be kept in mind that the contract creates only the relation out of which arises the common-law duty to exercise ordinary care. Thus in legal contemplation the contract merely creates the state of things which furnishes the occasion of the tort. This being so, the existence of a contract is ordinarily a relevant factor, competent to be alleged and proved in a negligence action to the extent of showing the relationship of the parties and the nature and extent of the common-law duty on which the tort is based.’”

⁸⁹ *In re Certified Question from Fourteenth Dist. Court of Appeals of Texas*, 479 Mich. 498, (Mich. 2007)

⁹⁰ See *Id.* Judge Kavanagh M. (dissenting) (“I dissent from the majority opinion because I do not believe that this Court should substantively decide this appeal. In fact, without the participation of Justice Young, who strongly believes that this Court lacks the constitutional authority to answer the certified question,¹ this Court would not have answered the question. I would point out the curiosity that Justice Young’s constitutional conscience would allow him to subordinate his deeply held belief to provide the fourth vote to answer the question in this case. Despite the fact that he has participated in answering certified questions before, the fact remains that had he not provided the deciding vote to answer *this* certified question, he would have caused the Court not to answer the question, which surely would have aligned much better with his view against providing a *527 foreign court with a “didactic exegesis on our law” than answering it. See *In re Certified Question (Veliz v. Cintas Corp.)*, citation omitted (2006) (Young, J., concurring). This situation differs from the previous cases in which Justice Young participated because in those cases there were enough votes to answer the question regardless of his participation. In other words, his vote in those cases had no impact on the fact that the question was answered

considerations of policy which lead the law to say that the plaintiff is entitled to protection”⁹¹.

Whether public policy reasons dictate such an outcome is analyzed below⁹². For the purposes of this sub-chapter, suffices to affirm that tort claims can indeed spring from contracts both for contractual and third parties.

One more remark is important before we move on. In the initial example, our coder’s lawyers would surely argue that the smart-system at issue neither malfunctioned nor delivered a wrong decision. And in fact, they are right. The system was not *stricto sensu* defective when denied access to Carol. On the contrary (a bit of foreshadowing here) it delivered the outcome it was supposed to, loyal to 1) the guidelines it was given by the developer and 2) the data it was fed with by the data scientists⁹³. So, a question arises: Can a contractual party be held responsible for harm without *a priori* having breached the contract at issue?

The answer to this question has been proved a complex task. The gist of judicial discussion, however, is that an interpretation rendering the breach of the contract a *sine qua non* condition for the genesis of a duty of care distorts the notion of the latter since the contract is only indicative of the relation from which the common law duty emanates. Entering into a contract with another pursuant to which one party promises to do something does not alter the fact that there exists a preexisting obligation or duty to avoid harm when one acts⁹⁴. In fact, determining whether a duty arises separately and distinctly from the contractual agreement does not necessarily involve reading the contract, noting the obligations required by it, and determining whether the plaintiff’s injury was contemplated by the contract⁹⁵. As it has held in *Pinnix v. Toomey*⁹⁶:

“But it must be kept in mind that the contract creates only the relation out of which arises the common-law duty to exercise ordinary care. Thus in legal contemplation the contract merely creates the state of things which furnishes the occasion of the tort”.

Applying this principle to our example, it seems likely that a claim highlighting the accuracy of an algorithmic calculation and its consistency with the contractual provisions that had been undertaken will not be sufficient *per se* to diminish the existence of a duty of care

⁹¹ PROSSER AND KEETON ON TORTS, (5TH ED), § 53, p. 356

⁹² See “Duty of care owed by developers”

⁹³ For a detailed description of the operation of the system see chapter on “Causality”

⁹⁴ *Rinaldo's Const. Corp. v. Michigan Bell Telephone Co.*, 454 Mich. 65, (Mich. 1997)

⁹⁵ *Davis v. Venture One Const., Inc.*, 568 F.3d 570, (6th Cir. 2009)

⁹⁶ *Pinnix v. Toomey*, 242 N.C. 358, (*S Nor.Car.* 1955)

owed by our coder. As a result, in principle, school administration and our coder could owe a duty of care separate and distinct from the contractually agreed course of actions. The question that now arises relates to whether developers themselves could be separately held to a professional standard of care arising from the nature of their profession? The answer to this question is of vital importance especially for the cases of economic loss.

Duty of care owed by developers

In defining which occupational groups are “professionals,” courts consider whether the practice of the occupation requires formal training and a license issued by a public body, whether the occupation has an internal code of conduct and discipline, and whether there is a need for complex discretionary judgments in carrying out the work⁹⁷. As far as the computer programmers are concerned, *Nimmer*⁹⁸ whose ideas on the issue are oft-cited in case law⁹⁹ is opposed to lifting the standards of reasonable care because:

- 1) The ability to practice the ‘profession’ of computer programming, despite the necessity for technical knowledge, is not restricted or regulated by state licensing laws;
- 2) Programming skills have proliferated more as a profession trained and regulated on the task; and
- 3) There is no substantial self-regulation or standardization of training within the programming or consulting professions.

Truth is that there has not been a single case granting a claim for professional malpractice against a computer programmer. However, today by taking into account the state-of-the-art in computational technology such a discussion cannot be restricted to a mere examination of legal precedent. The profession of software developers is projected to grow 24% from 2016 to 2026, much faster than the average for all occupations¹⁰⁰. Meanwhile, the overwhelming majority of the workload is undertaken by or outsourced from large companies whose entry-level employees have at least a degree in

⁹⁷ Restatement (Third) of Torts: Liab. for Econ. Harm § 4 TD No 1 (2012); *Hospital Computer Systems, Inc. V. Staten Island Hosp*, 788 F.Supp. 1351, (D.NJ 1992). (“A profession is not a business. It is distinguished by the requirements of extensive formal training and learning, admission to practice by a qualifying licensure, a code of ethics imposing standards qualitatively and extensively beyond those that prevail or are tolerated in the marketplace, a system for discipline of its members for violation of the code of ethics, a duty to subordinate financial reward to social responsibility, and, notably, an obligation on its members, even in non-professional matters, to conduct themselves as members of a learned, disciplined, and honorable occupation”.

⁹⁸ RAYMOND T. NIMMER, LAW OF COMPUTER TECHNOLOGY, (4TH ED)

⁹⁹ See for example *Ferris & Salter, P.C. V. Thomson Reuters Corp*, 819 F.Supp.2d 667, (ED.Mich. 2012); *Superior Edge, Inc. V. Monsanto Co*, 44 F.Supp.3d 890, (D. Min. 2014).

¹⁰⁰“Software Developers,” 2018, accessed 25/02/2019, <https://www.bls.gov/ooh/computer-and-information-technology/software-developers.htm>.

computer science or mathematics and a couple of years of work experience. Simultaneously, an ever-growing and interdisciplinary part of the scientific community has moved beyond the introductory discussion on the “Ethics in AI” and has started discussing techniques to “inject” fairness into the algorithmic systems. These techniques have yet to be solidified into a generally accepted code of practices and it is not this paper’s scope to predict that they will do. However, even if these endeavours will never be incorporated into a broadly accepted regulation for fair algorithmic practices, such an absence should not obscure the pragmatic level of responsibilities that lies on the shoulders of the decision-making systems’ developers.

Added to that, cases that developed the aforementioned and undisputed legal precedent have occasionally based their argumentation on grounds that today would seem debatable. In *Columbus McKinnon v. Semiconductor*¹⁰¹ the court dealt with an allegedly defective computer microprocessor (“chip”) utilized in the control board of a hoist. The court denied the legal basis for extending the doctrine of professional malpractice to cover independent computer consultants by arguing –among others- that there cannot be an independent duty of care separated from the already existent within the contractual framework since defendant’s duties are not affected by any significant public interest¹⁰². Reversely, what this argument implies is that the existence of public interest would be sufficient element for the recognition of a duty of care on the shoulders of computer programmers. Today, the use of machine learning algorithmic tools by police departments¹⁰³ and the justice system at large¹⁰⁴ points precisely to that direction. The incorporation of algorithms into a decision-making process of the public sector may come with the risk of creating ‘substantial’ or ‘genuine’ doubt as to why decisions were made and what conclusions were reached, both for the subject of the decision and the decision maker themselves¹⁰⁵. Moreover, serious concerns have been raised particularly in the US— ranging from discrimination in recidivism scores used in parole

¹⁰¹ *Columbus McKinnon Corp. V. China Semiconductor Co*, 867 F.Supp. 1173, (WD NY, 1994).

¹⁰² *Id.* (“Primarily, this is so because of the nature of his services—an unincorporated consultant engaged in the rather impersonal and relatively unregulated (compared to many other industries) field of computer design. [Quoting Sommer](fire safety heavily regulated). Also, the nature of his relationship with CM was arms-length and, while he may have been vested with a certain degree of responsibility, his duties were not affected by any significant public interest. If liability exists, it is purely contractual. Actually, public policy weighs against allowing tort liability considerations to interfere with the ordering of private contractual relationships in many instances, this being one of them”) quoting *East River S.S. Corp. v. Transamerica Delaval*, (1986)

¹⁰³ See *supra* 1

¹⁰⁴ See *supra* 2

¹⁰⁵ For example see Marion Oswald, "Algorithm-Assisted Decision-Making in the Public Sector: Framing the Issues Using Administrative Law Rules Governing Discretionary Power," *Philosophical Transactions of the Royal Society* (2018). Where author analyses the English version of the “duty to give reasons”;

decisions to uneven demographic targeting in systems used for policing on the basis of spatiotemporal crime risk¹⁰⁶. Inasmuch as public or private institutions will continue developing such tools, their programmers' ties with the public interest will strengthen.

Equally in *UOP v Andersen Consulting*¹⁰⁷, it was argued that services provided by computer consultants are distinct from those of lawyers and accountants since a client of the former can specify what the end product should be able to do: what information it should process, what forms it should produce, how data should be manipulated. Contrariwise according to the court, lawyers or accountants may offer different levels of service but within these levels of service, the client is not required or expected to be able to direct the conduct of the [professional] through contractual provisions¹⁰⁸. As we have seen above, however, software programmers usually enjoy a high degree of autonomy in the developing process that does not spring from the contract with the client. For instance, provisions regarding the process of information and the manipulation of data are not contractual but normative ones crystallized in official regulations. The other party cannot possibly acquire unambiguous knowledge of the amount of information that is processed and the way that this information is evaluated. The latter is usually difficult even for the developer itself. Thus, as computational technology becomes more complex, the client will be gradually withdrawing from specifying the developer's conduct and the developer, in turn, will be acquiring a degree of contractual freedom qualitatively similar to the lawyer's.

In the light of these new circumstances, should a future case arise involving the professional malpractice of a computer programmer, "public policy" and the "explicit contract" arguments as well as claims concerning the lack of 'standardization of training' or the 'on task learning' nature of the profession, would be difficult to establish. Contrariwise, issues of fairness raised by the scientific community regarding the ethical principles that programmers should share and the technical requirements that ought to deploy in order to safeguard these principles would be difficult to ignore. Judges will likely adopt an *ad hoc* approach by critically reflecting legal precedent on the contemporary status of the industry¹⁰⁹.

¹⁰⁶ Michael Veale, Max Van Kleek, and Reuben Binns, "Fairness and Accountability Design Needs for Algorithmic Support in High-Stakes Public Sector Decision- Making," (2018).

¹⁰⁷ *Uop V. Andersen Consulting*, 1997 WL 219820, (Conn 1997), (unpublished opinion).

¹⁰⁸ *Congregation of the Passion, Holy Cross Province V. Touche Ross & Co*, (1994).

¹⁰⁹ Interestingly, there are at least seven cases dealing with claims of professional malpractice against computer manufacturers that have based their dismissal decision mainly on the lack of legal precedent. +++

Damages

The economic loss rule

Examined separately, the nature of the damages suffered by Herianna and Carol includes personal injury, economic loss and emotional distress. However, the legal duty of care analyzed above is enforced primarily in cases of physical harm to person or property.

The economic loss doctrine is the jurisprudentially developed rule that restricts torts actions from seeking to recover economic damages that occurred during commercial transactions. Pure economic loss is more appropriately assigned to contract law and the remedies set forth in the UCC. *White* and *Summers* sum it up in the phrase: “[t]he economic loss doctrine is a crude proxy for the diving line between what is a tort and what is not”¹¹⁰. Once again, the issue of whether our smart-system will be considered product or service is critical.

The area of Product Liability Rules has been proved to be the most favourable for the application of the economic loss doctrine¹¹¹. When a product fails to work properly and causes economic damage to the buyer or user but does not cause any other damage, an overwhelming majority of courts have refused to permit recovery in tort¹¹². Apart from the cases where the plaintiff also suffers personal injury or damage to property, subsection (b) § 21 of the Third Restatement might be applicable to cases similar to the one at issue. When the principles of tort law recognize the right of a plaintiff to recover for economic loss arising from harm to another person, that right is included within the rules of § 21 and are recoverable. Thus, should local law permits recovery for the economic loss that Herianna suffered due to the fact that she paid 1) for her daughter’s medical treatment and 2) for classes with a private tutor for one week, then this loss will be recoverable under Product Liability Rules. Truth is, however, that the categories included in Subsection (b) have traditionally been limited in number¹¹³ and more generally, the courts have been proved very reluctant in permitting recovery for economic loss from defective products.

As *Gaebler* further argues¹¹⁴ there has been much discussion concerning the applicability of strict tort liability to economic loss resulting from defective products whereas there has been much less

¹¹⁰ WHITE & SUMMERS, UNIFORM COMMERCIAL CODE (Hornbook Series, 4th ed.), p. 386

¹¹¹ Restatement (Third) of Torts: Prod. Liab. § 21 (1998)

For purposes of this Restatement, harm to persons or property includes economic loss if caused by harm to:

(a) the plaintiff’s person; or (b) the person of another when harm to the other interferes with an interest of the plaintiff protected by tort law; or (c) the plaintiff’s property other than the defective product itself.

¹¹² David B. Gaebler, Negligence, Economic Loss, and the U.C.C., 61 Ind. L.J. 593 (1985)

¹¹³ Restatement (Third) of Torts: Prod. Liab. § 21 (1998) cmt (c)

¹¹⁴ See *supra* note 112

discussion, concerning recovery of such losses in negligence. In part, this may be due to the existence of a broader notion that, as a general matter, negligent injury to pure economic interests of any sort is simply not actionable.

For this reason, we will now turn to the judicially developed principles that have applied in cases where plaintiffs' economic losses resulted from defendants' negligent acts either in privity of contract or without it.

As a general rule, a suit for a negligent performance of contractual duties is clearly available even where only economic injury is alleged¹¹⁵. This principle illustrates a prominent exception to the rule dictating that a contract between two parties is the sole source of liability for any financial loss. Actions for professional negligence (also known as malpractice) were the dominant articulation of this principle and are part of a Tentative Draft of the Third Restatement¹¹⁶. Frequent cases solved under this principle involved attorneys, architects and accountants. However, liability for economic loss caused by negligent performance of services is not limited to professional malpractice actions but it can potentially extend to other service transactions as well¹¹⁷.

Historically, absent privity of contract, negligence liability for pure economic loss has been governed by the principles set out in *Biakanja v. Irving*¹¹⁸:

“The determination whether in a specific case the defendant will be held liable to a third person not in privity is a matter of policy and involves the balancing of various factors, among which are the extent to which the transaction was intended to affect the plaintiff, the foreseeability of harm to him, the degree of certainty that the plaintiff suffered injury, the closeness of the connection between the defendant's conduct and the injury suffered, the moral blame attached to the defendant's conduct, and the policy of preventing future harm”.

The Tentative Drafts of the *Third Restatement* also incorporate rules that govern liability for economic loss resulting from a third party's reliance on a defendant's statements or services¹¹⁹. The

¹¹⁵ *Consolidated Edison Co. Of New York, Inc. V. Westinghouse Elec. Corp*, (1983).

¹¹⁶ Restatement (Third) of Torts: Liab. for Econ. Harm § 4 TD No 1 (2012) (“A professional is subject to liability in tort for economic loss caused by the negligent performance of an undertaking to serve a client”.)

¹¹⁷ See supra note 114

¹¹⁸ *Biakanja V. Irving*, (1958).

¹¹⁹ Restatement (Third) of Torts: Liab. for Econ. Harm § 5-6 TD No 1 (2012) (“

general theory of liability is the same under both Sections 5 and 6. Section 5 covers the cases of negligent misrepresentations upon which a third party relied while section 6 is broader covering the overall services supplied by the defendant¹²⁰. A defendant held liable under either Section must “invite reliance” by the plaintiff. But yet again, the criterion of “invited reliance” does not define the outer limits of liability for pure economic loss. On the contrary, liability for such loss can exist without this invitation¹²¹.

Relevant to our analysis are cases where an actor who negligently supplies false information regarding a claimant to another has been held liable to the claimant for harm resulting from the other's response to the information¹²². In *Sharpe v. St. Luke's Hosp*¹²³, the Supreme Court of Pennsylvania allowed a claim against a hospital for mishandling the plaintiff's urine sample by holding that:

“The concept of duty is rooted in public policy, and the determination of whether a duty should be imposed upon

(1) One who, in the course of his business, profession, or employment, or in any other transaction in which he has a pecuniary interest, performs a service for the benefit of others, is subject to liability for pecuniary loss caused to them by their reliance upon the service, if he fails to exercise reasonable care in performing it. (2) One who, in the course of his business, profession, or employment, or in any other transaction in which he has a pecuniary interest, performs a service for the benefit of others, is subject to liability for pecuniary loss caused to them by their reliance upon the service, if he fails to exercise reasonable care in performing it.

(a) by the person or one of a limited group of persons for whose benefit the actor performs the service; and (b) through reliance upon it in a transaction that the actor intends to influence. (3) A plaintiff's recovery under this Section is subject to the same rules of comparative responsibility that apply to other claims of negligence. (4) This Section does not recognize liability for negligence in the course of negotiating or performing a contract between the parties.

¹²⁰ Thus: “§ 5 recognizes liability when an accountant makes negligent misrepresentations about a firm and invites reliance on them by investors. An accountant can likewise be held liable under this Section when the facts are the same but the negligence takes the form of a careless oversight in the accountant's inspection, rather than a misstatement afterwards”. See Restatement (Third) of Torts: Liab. for Econ. Harm § 6 TD No 1 (2012)

¹²¹ See Mark P. Gergen, "The Ambit of Negligence Liability for Pure Economic Loss," *Arizona Law Review* (2006). citing the following categories of cases: third-party beneficiary cases (see for example *Biakanja v. Irving*, 320 P.2d 16 (Cal. 1958)); cases where the claimant relies on the actor but the actor does not reasonably appear to invite the reliance (see for example 737 P.2d 503 (Nev. 1987)); cases resembling resemble the liability under modern accident law (see for example *The American Tort System's Response to Environmental Disaster: The Exxon Valdez Oil Spill as a Case Study*, 19 *Stan. Envtl. L.J.* 259, 278 (2000);

¹²² *Id.*

¹²³ *Sharpe v. St. Luke's Hosp*, 573 Pa. 90, (Pa. 2003)

an alleged tortfeasor involves a balancing of the following factors:

(1) the relationship between the parties; (2) the social utility of the actor's conduct; (3) the nature of the risk imposed and foreseeability of the harm incurred; (4) the consequences of imposing a duty upon the actor; and (5) the overall public interest in the proposed solution.

Equally, cases resembling modern accident law can potentially offer useful lines of reasoning for the cases where smart-software causes economic loss. For example, the court in *Quest Diagnostics vs MCI WorldCom*¹²⁴ faced the issue of economic loss resulting from a contract of services between two defendants and owed to a third party. By distinguishing the facts in dispute from other Michigan cases where the parties to the litigation were involved directly or indirectly in a transaction of goods, the court held that:

[W]hile this Court has applied the economic loss doctrine to bar tort claims against parties who were suppliers of components of goods purchased by the plaintiffs, there is no support for applying the doctrine in the absence of a transaction between the parties or others closely related to them, whereby the allocation of risks could be negotiated. Here, there was no transaction between the parties that is used as the basis of plaintiffs' claims. Accordingly, there is no basis for applying the economic loss doctrine in this case to bar plaintiffs' tort claim, and we refuse to extend this judge-made doctrine to these circumstances”.

Hence, it is by no means self-evident that the economic loss rule will apply in cases similar to our example. Presumably, the classification of our smart-system as “product” will favour the application of the economic loss rule. However, cases like this, where there is a need for liability to protect people from unreasonable conduct but in the meantime there are also worries about the efficacy of tort liability because of administrative costs, floodgate and the risk of error offer a fertile ground for judicial reasoning. We could safely argue, however, that the ultimate test for the application of the doctrine will emanate from public policy imperatives.

¹²⁴ *Quest Diagnostics vs MCI WorldCom*, 254 Mich.App. 372, (Mich.App.2003)

Emotional distress

In our example, Herianna, a psychologically fragile individual, was devastated by witnessing her daughter getting injured and “expelled” from her school. Equally, Carol herself, felt greatly “stigmatized” and suffered only minor bodily injuries. Three cases will help us shape the landscape.

In *Dillon v. Legg*¹²⁵, Margery Dillon, a mother who had experienced the tragedy of witnessing her daughter’s death by a negligent motorist, sued the latter for physical injury and emotional shock. The Superior Court, Sacramento County, granted defendant summary judgment on the mother's cause of action for emotional shock, but on appeal, the Supreme Court of California reversed¹²⁶. In determining the foreseeability of such an injury and/or the potential existence of a duty of care owed by the defendant, the court held that:

“[T]he courts will take into account such factors as the following: (1) Whether plaintiff was located near the scene of the accident as contrasted with one who was a distance away from it. (2) Whether the shock resulted from a direct emotional impact upon plaintiff from the sensory and contemporaneous observance of the accident, as contrasted with learning of the accident from others after its occurrence. (3) Whether plaintiff and the victim were closely related, as contrasted with an absence of any relationship or the presence of only a distant relationship”.

In *Quill v. Trans World Airlines, Inc.*¹²⁷ TWA flight 841 from New York to Minneapolis was cruising at an altitude of 39,000 feet when it suddenly rolled over and plunged downward. Its tailspin continued for the next 40 seconds at speeds just below the speed of sound, causing the plane to violently shake. At approximately 5,000 feet the pilots regained control of the plane, about 5 seconds before it would have struck ground. The force exerted on the plane and the passengers equaled approximately 6 G's. Testimony indicated that force wrinkled the fuselage skin of the aircraft and bent its wings. Thankfully, the plane landed safely. A passenger brought action against airline seeking to recover damages for emotional distress. According to his testimony quoted in court’s decision, “[h]e believed his dead was certain. The G force was so strong that he could not lift his arm to

¹²⁵ *Dillon v. Legg*, 68 Cal.2d 728, (Cal.1968)

¹²⁶ See *supra* note 86, at p. 353 (“when a child is endangered, it is not beyond contemplation that its mother will be somewhere in the vicinity, and will suffer serious shock”)

¹²⁷ *Quill v. Trans World Airlines, Inc.*, 165 N.W.2d 438, (Minn.Ct.App.1985)

reach the oxygen masks which had shaken loose”. The court found for the plaintiff:

“Although plaintiff’s symptoms are less severe than those in *Okrina* and *Purcell*, we hold under the circumstances of this case that he has stated a prima facie case [...]The nature of that experience guarantees plaintiff suffered severe emotional distress during the descent and the emergency detour to Detroit. This conclusion is supported by the suffering of many others who shared his experience. Plaintiff’s recurring distress is no doubt genuine as well. His sweaty hands, elevated blood pressure and other signs of distress provide, in this case, sufficient physical symptoms to warrant the law’s recognition of his claim. Therefore we hold that the law permits recovery of damages for plaintiff’s emotional distress”.

In *Chizmar v. Mackie*¹²⁸, the plaintiff, a married woman and mother of two, was falsely diagnosed positive for human immunodeficiency virus (HIV). As a result of the misdiagnosis, she brought action against the physician –among others- for emotional distress resulting from the doctor’s actions. On this claim, the Supreme Court of Alaska found for the plaintiff:

“We reverse the superior court’s holding that physical injury is required to support recovery for negligent infliction of emotional distress. Damages for negligent infliction of emotional distress are recoverable, provided that such damages are foreseeable and severe, and arise from circumstances in which the defendant owes the plaintiff a preexisting duty to refrain from causing distress”.

The abovementioned cases encapsulate the primary categories of cases where the plaintiff can recover for emotional distress. The first paradigm refers to the “bystander rule”¹²⁹ where two strangers

¹²⁸ *Chizmar v. Mackie*, 896 P.2d 196, (Al. 1995)

¹²⁹ Restatement (Third) of Torts: Phys. & Emot. Harm § 48 (2012):

“An actor who negligently causes sudden serious bodily injury to a third person is subject to liability for serious emotional harm caused thereby to a person who: (a)

are involved in an accident which results in severe physical injury and parasitic emotional distress. The second one exemplifies the cases where the actor's negligent conduct places the person seeking recovery in danger of bodily harm¹³⁰. The third requires the existence of a specific relationship¹³¹ that binds the plaintiff and defendant as well as a derivative duty of care owed by the latter, the breach of which causes emotional trauma to the former¹³². Hence, both categories are circumscribed by explicit limitations¹³³.

perceives the event contemporaneously, and (b) is a close family member of the person suffering the bodily injury.

See for example *Clohessy v. Bachelor*, 675 A.2d 852 (Conn. 1996); *Barnhill v. Davis*, 300 N.W.2d 104 (Iowa 1981); *In re Med. Review Panel Bilello*, 621 So. 2d 6 (La. Ct. App. 1993); *Sacco v. High Country Indep. Press, Inc.*, 896 P.2d 411 (Mont. 1995); *Portee v. Jaffee*, 417 A.2d 521 (N.J. 1980); *Muchow v. Lindblad*, 435 N.W.2d 918 (N.D. 1989); *Paugh v. Hanks*, 451 N.E.2d 759 (Ohio 1983); but see *Montoya v. Pearson*, 142 P.3d 11 (N.M. Ct. App. 2006); *Trombetta v. Conkling*, 626 N.E.2d 653 (N.Y. 1993); *Jun Chi Guan v. Tuscan Dairy Farms*, 806 N.Y.S.2d 713 (App. Div. 2005); *Casale v. Unipunch, Inc.*, 578 N.Y.S.2d 46 (App. Div. 1991).

¹³⁰ Restatement (Third) of Torts: Phys. & Emot. Harm § 47 (2012):

An actor whose negligent conduct causes serious emotional harm to another is subject to liability to the other if the conduct: (a) places the other in danger of immediate bodily harm and the emotional harm results from the danger[...];

For courts permitting recovery for doomed airplane passengers, see *Shu-tao Lin v. McDonnell Douglas Corp.*, 742 F.2d 45 (2d Cir. 1984); *Beynon v. Montgomery Cablevision Ltd. P'ship*, 718 A.2d 1161 (Md. 1998) (affirming recovery for pre-impact emotional harm in automobile crash based on 71.5 feet of skid marks); but see cases where jurisdictions require physical harm to be a consequence of emotional harm for the latter to be recoverable. See *Fogarty v. Campbell 66 Express, Inc.*, 640 F. Supp. 953 (D. Kan. 1986); *In re Air Crash Disaster Near Chi., Ill. on May 25, 1979*, 507 F. Supp. 21 (N.D. Ill. 1980); see also *Steel Techs., Inc. v. Congleton*, 234 S.W.3d 920 (Ky. 2007)

¹³¹ Restatement (Third) of Torts: Phys. & Emot. Harm § 47 (2012):

An actor whose negligent conduct causes serious emotional harm to another is subject to liability to the other if the conduct: [...] or (b) occurs in the course of specified categories of activities, undertakings, or relationships in which negligent conduct is especially likely to cause serious emotional harm;

See for example the special category of “funeral cases”: *Christensen v. Super. Ct.*, 820 P.2d 181 (Cal. 1991); *Blackwell v. Dykes Funeral Homes, Inc.*, 771 N.E.2d 692 (Ind. Ct. App. 2002) (funeral home lost cremated remains of plaintiffs' child); *Menorah Chapels at Millburn v. Needle*, 899 A.2d 316 (N.J. Super. Ct. App. Div. 2006) (contract to provide funeral services can be basis for recovery of emotional-harm damages); the rule has also been applied to other categories of cases. See for example *Spangler v. Bechtel*, 958 N.E.2d 458 (Ind. 2011) (permitting parents to pursue non-bystander claim for emotional harm resulting from stillbirth of child); *Fisher v. McDonald's Corp.*, 810 A.2d 341 (Conn. Super. Ct. 2002) (human blood on hamburger bun).

¹³² See *supra* note cmt f:

Some jurisdictions have also applied the rule stated in Subsection (b) to circumstances in which, for example, a physician negligently diagnoses a patient with a dreaded or serious disease; a physician negligently causes the loss of a fetus; a hospital loses a newborn infant; a person injures a

However, the acknowledgement of negligent infliction of emotional distress as a freestanding tort and an independent duty should be treated with caution¹³⁴. There are indeed times when the emotional trauma might be equal or even bigger than the physical one. No doctrine or norm can turn a blind eye on a parent who witnesses her child being struck by an automobile and die. In such cases, it is in society's best interests to make sure that a fragment of the burden will be lifted from the plaintiff's shoulders. On the other hand, our world is not –at least for now- the Garden of Eden. Instead, technological evolution creates an infinite source of products and services that could cause, disseminate and magnify scenes of blood, death and horror. As *Keating* persuasively describes: “[t]his unfortunate fact [witnessing events of terror and horror] is simply an inevitable byproduct of the reality that essential modern activities harness the enormous destructive power of advanced technology. We need the activities and, therefore, we must generally bear the distress they cause when they go awry¹³⁵”.

There is no general duty of care “not to emotionally harm your neighbour” owed by an individual to an infinite universe of people. Contrariwise, recovery for emotional harm, albeit the differences based on the jurisdiction, is restricted by certain limitations who shield defendants from an indeterminate and excessive liability. For instance, “bystander’s” emotional distress must be triggered by the “contemporaneous¹³⁶” sight of a “serious bodily injury¹³⁷” to a “close

fetus; a hospital (or another) exposes a patient to HIV infection; an employer mistreats an employee; or a spouse mentally abuses the other spouse

¹³³ Both situations avoid the limitless reach of a freestanding negligent infliction of emotional distress claim. The bystander claim is limited by requirements of physical harm to another person and by other elements, which may involve matters of physical proximity and relationship. The claim in the contract or relationship situation may be defined in terms of negligence, but its reach is limited by the objects of the contract or relationship

¹³⁴ See David Crump, *Negligent Infliction of Emotional Distress: An Unlimited Claim, but Does It Really Exist*, 49 *Tex. Tech L. Rev.* 685 (2017); Gregory C. Keating, *Is Negligent Infliction of Emotional Distress a Freestanding Tort*, 44 *Wake Forest L. Rev.* 1131 (2009);

¹³⁵ See *Keating Id.* (“We cannot seriously contemplate a general duty not to inflict emotional distress negligently unless we are prepared to retreat, with Kennedy and Rousseau, to a simpler life and a pastoral world”).

¹³⁶ See *supra* note, cmt e: (“To recover under this Section, a person who suffers emotional harm must have contemporaneously perceived the events that caused physical harm to the third person. It is not enough that the person later learned about the events, later viewed a recording of them, or later observed the resulting bodily injuries. While in most cases the person will see the events, the perception required by this Section is not limited to sight”).

¹³⁷ *Id.*, cmt l (“The requirement that the third person must suffer “serious” bodily injury is grounded in the need to provide limits on liability under this Section. It is also based on the generality that modest or minor physical injury is unlikely to produce a substantial emotional response by an observer, even one who is a close family member. Death, significant permanent disfigurement, or loss of a body part or function will almost always be sufficient for a jury to find this requirement satisfied. By contrast, bruises, cuts, single simple fractures, and other injuries that

family member¹³⁸". Conversely, the "zone of danger" created by the actor must pose a threat for "immediate bodily harm" while accordingly, the "pre-existing relationship" must create "serious emotional harm¹³⁹". The rationale of this limitation reflects the omnipresent forethought rooted in the floodgate argument whose scope is to avert excessive litigation. It is the same argument that would most probably bar Herianna's and Carol's claim.

Indeed, our example falls within the "bystander's" paradigm but the injuries suffered by Carol are only minor compared to the threshold set by common law for "serious body injury" that could have potentially justified Herianna's parasitic emotional distress, not to mention her post-traumatic depression. Indeed, witnessing your daughter's stigmatization is harsh but "law is" that Herianna has to bear it.

Now, as we are finishing the chapter on the recoverable damages it is time for the interlude I wrote about on introduction. Think of the following hypothetical scenarios:

1) A smart-system programmed to control traffic lights according to real-time congestion malfunctions. Cars A and B collide. The drivers in both cars die instantly but the two co-drivers survive only to witness the death of their husband and best-friend, respectively.

2) Jeremiah, an African cook and father of two, has been pulled over and interrogated by police officers twice within a week. Both times, the driver was getting his children at school. Its identification was a result of a risk-assessment tool.

3) Kathrine, a 12 years old girl, was surfing the internet when an advertisement appeared entitled "the perfect body". She read the article with interest. 1 hour later she went to sleep and checked her naïve Instagram account. She saw another advertisement on this "perfect body" and then, another one. 3 years later, she has yet to exit the loop.

4) A smart-medical device falsely diagnoses Mr. Peaceful with cancer, causing him and irreversible emotional trauma.

do not require immediate medical treatment will rarely be sufficient to satisfy this requirement").

¹³⁸ *Id.*, cmt f ("The requirement that the bystander be a close family member reflects a pragmatic recognition that a line must be drawn and that witnessing physical injury to a close family member will, in general, cause a more serious shock than if the injured party is not related").

¹³⁹ See *supra* note, cmt l ("The requirement that emotional harm be serious in order to be recoverable ameliorates two concerns regarding providing a claim for negligent infliction of emotional harm. The threshold reduces the universe of potential claims by eliminating claims for routine, everyday distress that is a part of life in modern society. And at the same time, the seriousness threshold assists in ensuring that claims are genuine, as the circumstances can better be assessed by a court and jury as to whether emotional harm would genuinely be suffered").

Needless to say that the above examples are diametrically opposite. The purpose of this chapter's conclusion is not simply to provide case-studies for further contemplation but to challenge a broader debate. Reading these four examples independently and comparatively entails the risk of missing the point I want to echo. *Keating*¹⁴⁰ at his conclusion stresses the need for a more general discussion on the contemporary philosophy of tort law with the goal of conceptualizing what "harm" connotes today:

"We have long understood the law of torts to be a law of responsibility for harm done, and harm has occupied a central place in liberal moral and political thought at least since John Stuart Mill penned *On Liberty*. Surprisingly little contemporary tort scholarship, however, talks about harm, and we lack a well-developed account of tort law's relation to harm".

And proceeds to identify the two paradigms for the contemporary conception of the notion of harm:

"So we must turn back to moral and political theory. Contemporary philosophical thinking about harm is split between two leading accounts of its character and significance. One account holds that harm should be understood as a setback to a legitimate interest, which interest is protected by a legal right[...] The competing account of harm connects it to autonomy. On this account, harm is special because it violates our sovereignty".

This debate *Keating* aspires to trigger is even more essential today. Technology stretches the boundaries of our nature. It alters our relation with our fellow human beings, metamorphoses the physical world that surrounds us, and reformulates our identity. At the same time, it materializes unseen dangers for our species and transpires eminent and present threats for our spheres of individual autonomy. The evolution of technology triggered meaningful changes in our conceptual perception of what it means to be "fine". The pragmatic meaning of words like "well-being" along with the normative power of notions like "autonomy", have fundamentally changed to become personal priorities. We have started encountering "harm" in previously

¹⁴⁰See *Keating* supra note

unforeseen ways. Through our screens, we witness decapitations of journalists in tracksuits and lapidations of women in unknown streets of foreign countries. Through the news, we learn that our lifetime information and our sensitive data have been leaked by unknown intruders to unknown agents. Yet, we endure these things and we are supposed to do so. As Keating further puts it: “If we are told by the law that it will not treat our emotional distress as worthy of tort protection, to a significant degree we can learn to protect ourselves by mastering our emotions”. What we urgently need to discuss though, is the point of no return, the point beyond which the law will have to protect our emotional durability, the least pardonable invasion in our personal sovereignty. This discussion is late already. We have unconsciously and voluntarily yielded a part of our emotions to the “loops” and we have conceded segments of our autonomy to the “Accepts”. Tort law needs a contemporary dose of reality. And the discussion on what is “harm” today, has to begin with the question of “what is tolerable and what is not” for our emotional selves.

This interlude terminates the discussion on the recoverable damages from harms caused by defects in an automated decision-making system. So far we have affirmed that a duty of care can exist no matter the classification of the smart-system. Having discussed that, our analysis will now deal with the content of this duty.

Duty of care

In deciding a case of negligence, courts are required to incrementally build their reasoning by consecutively examine the issues of duty, breach of duty, factual causation, proximate causation and damages suffered. To establish a *prima facie* case of negligence, a plaintiff must prove that “(1) the defendant owed the plaintiff a legal duty, (2) the defendant breached the legal duty, (3) the plaintiff suffered damages, and (4) the defendant's breach was a proximate cause of the plaintiff's damages¹⁴¹.

The criterion of foreseeability is certainly present in the search for “breach of duty”¹⁴² and the “proximate causation”¹⁴³, whereas in

¹⁴¹ *Loweke V. Ann Arbor Ceiling & Partition Co.*, 489 Mich. 157 (Mich. 2011).

¹⁴² See W. Jonathan Cardi, *Purging Foreseeability*, 58 Vand. L. Rev. 739 (2005): (“Where the judge has determined that the defendant owed a duty and has delineated the broad contours of that duty in a statement of the “standard of care,” the jury must then decide, in the context of breach, whether the defendant's conduct failed to conform to that standard.[...] Where judges rule on breach as a matter of law, “reasonableness” often turns on 1) the degree of foreseeable likelihood, from the point of view of a reasonable person in defendant's position, that defendant's actions might result in injury; 2) the range in severity of foreseeable injuries; and (3) the benefits and burdens of available precautions or alternative manners of conduct”).

¹⁴³ See *supra* note 141 (“Proximate cause provides an outer boundary of tortious responsibility that protects actors from liability for consequences falling outside the scope of their wrongdoing, beyond their moral accountability. [...]“unforeseeable” consequence eventuates from an action, the fact that it lies outside the bundle of consequences the actor reasonably should have contemplated means that it

the very notion of “duty”, foreseeability has an interesting history. And the course of this history will potentially affect the way judges view the coders of a smart-system.

Foreseeability in the “duty” element

“Foreseeability is the great paradox of tort: one of its most vital moral tethers, yet irretrievably its most elusive”¹⁴⁴. Emanating from the principle that wrong should only be attributed to people who 1) had the capacity to choose alternatively and 2) did so incorrectly according to specific standards¹⁴⁵, foreseeability has historically been the most representative yardstick for indicating how far society is willing to go to ascribe responsibility.

The element of foreseeability and whether it should be a criterion for deciding upon the existence of a duty of care has dichotomized courts and scholars. The contrasting opinions of Justice *Cardozo* and Justice *Andrews* in the seminal *Palsgraf v. Long Island Railroad* case uniquely elucidate this battle¹⁴⁶.

In that case, Justice *Cardozo* opined that:

“The risk reasonably to be perceived defines the duty to be obeyed, and risk imports relation”.

Conversely, Justice *Andrews* wrote in dissent:

“Due care is a duty imposed on each one of us to protect society [...] not to protect A, B, or C alone”.

This judicial polarity has left its stamp on the evolution of negligence by depicting two different perspectives on the nature of duty of care. On the one hand, directly or indirectly influenced by Justice *Cardozo*’s argumentation, courts have frequently not only

probably did not inform the actor's deliberations and choice, and thus that the consequence did not reflect his will”).

¹⁴⁴ David G. Owen, Figuring Foreseeability, 44 Wake Forest L. Rev. 1277 (2009)

¹⁴⁵ *Id.*

¹⁴⁶ See *supra* note 142; Prosser’s opinion on this disagreement is noteworthy. See William L. Prosser, *Palsgraf Revisited*, 52 Mich. L. Rev. 1 (1953-1954) (“Before leaving the opinions, the comment may be ventured that, with due respect to the superlative style in which both are written, neither of them wears well on long acquaintance. Both of them beg the question shamelessly, stating dogmatic propositions without reason or explanation. If there is or is not a duty to the plaintiff not to injure her in this way, nothing else remains to be said. Both of them assume that there was no relation whatever between the defendant and the plaintiff on which a duty might be founded; both utterly ignore the fact, on which the appellate division laid stress, that Mrs. *Palsgraf* was a passenger. From the moment that she bought her ticket the defendant did in fact owe her a duty of the highest care, one of the most stringent known to the law. The question was not one of injury to some stranger across the street, but of whether the duty to a passenger extended to the consequences of negligence threatening another passenger-which may very well be a different thing altogether”)

included but substantially relied on the foreseeability of the harm in determining the existence of a duty of care¹⁴⁷. As *Dean Prosser* notes: “[for Justice Cardozo] [n]egligence must be a matter of some relation between the parties, some duty, which could be founded only on the foreseeability of some harm to the plaintiff in fact injured”¹⁴⁸. Equally, one of the most influential tests for affirming a duty of care, developed by the Supreme Court of California in the oft-cited *Rowland v. Christian* case¹⁴⁹, has set the element of foreseeability as the first on the list to be explored when deciding upon a duty of care. According to this way of thinking, the owed duty of care will be judged in tandem with the foreseeable plaintiff and the foreseeable risk or consequences of the harm in dispute¹⁵⁰. Such an approach, however, has been criticized on two grounds. Firstly, in this way foreseeability inevitably permeates to the facts in dispute. Inasmuch as a judgment on the existence of a duty of care is a “normative inquiry”¹⁵¹ inextricably linked with social and policy goals¹⁵², facts in the case should be left out of the equation. Secondly and relatedly, as *Dobbs* persuasively notes, the element of foreseeability has been frequently used as a vehicle to decide upon issues concerning the breach rather than the existence of a duty of care, thereby undermining the jury’s role in the former’s determination¹⁵³.

¹⁴⁷ See for example *DiBiasi v. Joe Wheeler Elec. Membership Corp.*, 988 So. 2d 454, 461 (Ala. 2008) (foreseeability is “[t]he key factor” in the duty determination); *Winschel v. Brown*, 171 P.3d 142, 146 (Alaska 2007) (foreseeability is central to the duty inquiry, but a broad conception of foreseeability is to be used); *Coca-Cola Bottling Co. v. Gill*, 100 S.W.3d 715, 724 (Ark. 2003) (duty requires only that the “defendant be able to reasonably foresee an appreciable risk of harm to others”); *Castaneda v. Olsher*, 162 P.3d 610, 615 (Cal. 2007) (foreseeability of harm listed first among factors in determining duty’s existence); *Keller v. Koca*, 111 P.3d 445, 448 (Colo. 2005) (foreseeability is part of duty analysis);

¹⁴⁸ See *Prosser supra* note 146

¹⁴⁹ *Rowland vs Christian*, 443 P.2d 561, (Cal. 1968) (“A departure from this fundamental principle involves the balancing of a number of considerations; the major ones are the foreseeability of harm to the plaintiff, the degree of certainty that the plaintiff suffered injury, the closeness of the connection between the defendant’s conduct and the injury suffered, the moral blame attached to the defendant’s conduct, the policy of preventing future harm, the extent of the burden to the defendant and consequences to the community of imposing a duty to exercise care with resulting liability for breach, and the availability, cost, and prevalence of insurance for the risk involved”)

¹⁵⁰ See *Cardi supra* note 142

¹⁵¹ 15 Cal.4th 456

¹⁵² For example see *Cabral v. Ralphs Grocery Co.*, 248 P.3d 1170, (Cal.2011) citing *Rowland supra* note (“These policy considerations include the moral blame attached to the defendant’s conduct, the policy of preventing future harm, the extent of the burden to the defendant and consequences to the community of imposing a duty to exercise care with resulting liability for breach, and the availability, cost, and prevalence of insurance for the risk involved”)

¹⁵³ See Dan B. Dobbs, *THE LAW OF TORTS* § 227, at 580 (“Possibly some courts are really using the no-duty locution as a convenient but misleading way to decide the *breach* of duty issues[...]deciding issues about costs, benefits, and foreseeability that are normally jury questions. Worse, they might be deciding those cases without the benefit of appropriate evidence about the costs and benefits”) cited by *Cardi supra* note 142.

These concerns were consolidated and incorporated in the *Third Restatement* and marked one of its most noteworthy amendments. In Section 7(a) we read:

(a) An actor ordinarily has a duty to exercise reasonable care when the actor's conduct creates a risk of physical harm.

(b) In exceptional cases, when an articulated countervailing principle or policy warrants denying or limiting liability in a particular class of cases, a court may decide that the defendant has no duty or that the ordinary duty of reasonable care requires modification.

Building on *Cardi's* argumentation¹⁵⁴, the Third Restatement erased the element of foreseeability from the duty of care determination:

“Determinations of no duty are categorical while foreseeability cannot be determined on a categorical basis. Foreseeability necessarily depends on the specific facts of the case and hence is appropriately addressed as part of the negligence determination [...] Avoiding reliance on unforeseeability as a ground for a no-duty determination and instead articulating the policy or principle at stake will contribute to transparency, clarity, and better understanding of tort law¹⁵⁵”.

This shift demonstrates the significance of the coupling between duty determination and policy goals. So far, the malleability of the foreseeability concept had created a nebulous regime which, driven by judges' reluctance to mix with policy issues, quite frequently blanketed judgment that in reality were pure policy-oriented decisions. *Cardi* sums it up well to support his argument that this amendment is a true “boon to the rule of law”: “By instructing judges that a refusal to impose a duty despite the defendant's creation of a risk must turn on an exceptional problem of policy or principle, Section 7 [of the Third Restatement] encourages judges to be

¹⁵⁴ See Restatement (Third) of Torts: Phys. & Emot. Harm § 7 (2010), cmt j (“This Comment was not contained in the original version of this Section in Tentative Draft No. 1. However, an article written after Tentative Draft No. 1 makes an attractive case for removing the foreseeability of risk from duty determinations”)

¹⁵⁵ *Id.*

transparent in their reasons for declining to impose a duty, rather than to rely on the screen of foreseeability¹⁵⁶. Courts have seemed to take these remarks into account. Truth is that the overwhelming majority of the states recognize the element of foreseeability as an ingredient of the duty of care analysis¹⁵⁷ whereas case law holding the opposite is scarce¹⁵⁸. However, a closer case-by-case analysis will reveal that courts have been starting to refocus their attention towards the public policy scope of the duty of care. A prominent example of this shift is the Supreme Court of California. For years, following the seminal *Rowland* case, the court has been explicitly holding that foreseeability is central to duty analysis. However, without deviating from the longstanding principle, it seems to adopt an approach for duty that resembles that of the Third Restatement:

“[a]ll persons are required to use ordinary care to prevent others being injured as the result of their conduct.” Although it is true that some exceptions have been made to the general principle that a person is liable for injuries caused by his failure to exercise reasonable care in the circumstances, it is clear that in the absence of a statutory provision declaring an exception to the fundamental principle enunciated by section 1714 of the Civil Code, no such exception should be made unless clearly supported by public policy¹⁵⁹.

¹⁵⁶ See *supra* note 143

¹⁵⁷ See Benjamin C. Zipursky, *Foreseeability in Breach, Duty, and Proximate Cause*, 44 *Wake Forest L. Rev.* 1247 (2009) (“The reality, as the prior footnote indicates, is that forty-seven states plainly do give foreseeability a significant role in duty analysis”).

¹⁵⁸ See for example *Gipson v. Kasey*, 150 P.3d 228, 231 (Ariz. 2007); *Gates v. Richardson*, 719 P.2d 193 (Wyo. 1986) (deciding that a duty to avoid negligent infliction of emotional harm should be recognized and that foreseeability plays no role in such determination); see also *Maguire v. Hilton Hotels Corp.*, 899 P.2d 393 (Haw. 1995) (foreseeability for duty purposes is a matter to be determined by the jury); see also 191 P.3d 1062 (Haw. 2008); *Herrera v. Quality Pontiac*, 73 P.3d 181, 196 (N.M. 2003) (Bosson, J., concurring) (“When we attempt to define legal duty in terms of a foreseeable plaintiff, it is all too tempting to use ‘foreseeability’ as a surrogate for result-oriented conclusions.”)

¹⁵⁹ See *John B. v. Superior Court*, 137 P.3d 153, 161-162 (Cal. 2006); Interestingly, the same court had delineated the line of separation between the decision on duty and foreseeability for harm even before the Third Restatement. For example see *Ballard v. Uribe*, 715 P.2d 624, (Cal. 1986) (“Although the location in which defendant left his machinery, as well as the other steps which defendant may have taken to minimize the danger of injury—for example, notifying Atkinson's foreman and other supervisory employees of the lift's dangerous condition—could well have been found by the jury to render defendant nonnegligent in controlling his machinery, those factors, in themselves, did not negate defendant's general duty—as

Now, why should developers care about where foreseeability lies? How does our duty analysis fit our example? The first element that a court will examine in a case like this is the duty of care owed by the people involved. We will focus on the case of the developer of the smart-system. By ignoring the *Third Restatement* and applying the foreseeability element in the developer's duty analysis, a court would probably decide that the outcome is not closely related to what is reasonably expected by the performance of such a system. In fact, these systems' primary goal is to secure students, teachers and staff and for this reason, they are programmed to deny access to those who are algorithmically labelled as dangerous. The coincidence of the heavy rain and the parent's madness to protect their children is something unforeseeable and cannot by itself create a duty of care. As a result, the developer, absent duty of care, would not be found negligent. Now, *audietur et altera pars*. Imagine that the court, pursuant to the provisions of the *Third Restatement*, denies the examination of foreseeability during the duty analysis and focuses on the social goals surrounding the potential duty by weighing policy considerations for and against the imposition of liability. A security system is supposed to protect people and reassure that they will have access to everywhere they have a right to move freely. Moreover, such systems must facilitate the quick flow of people in crowded areas. As a result, it could be argued that all those involved in the management of such systems owe a general duty of care not to harm those who are using these systems. In our case, the system failed in fulfilling its primary social goals. This reasoning eventually reaffirms that a duty of care is owed by the developer. However, this *per se* is not a ticket to liability. It does mean, though, that the issue of whether its breach is foreseeable and whether it had been the proximate cause of the deaths and injuries that occurred, will be decided according to the jury's primacy as factfinder¹⁶⁰. And this may very well be a different thing altogether.

the owner of a piece of heavy construction machinery—to use due care to prevent injurious misuse. That general duty applies wherever the machinery may be found”)

¹⁶⁰ A detailed description of what it means for the developer's interests to be judged by the jury rather than the court remains out of the scope of this paper since the author at this point and absent of relevant case-law can only use his instinct to argue. However, a reference made in the *Sioux City & P. R. Co. v. Stout*, 84 U.S. 657, (US Supr.C. 1893) is worth-mentioning: (“Upon the facts proven in such cases, it is a matter of judgment and discretion, of sound inference, what is the deduction to be drawn from the undisputed facts. Certain facts we may suppose to be clearly established from which one sensible, impartial man would infer that proper care had not been used, and that negligence existed; another man equally sensible and equally impartial would infer that proper care had been used, and that there was no negligence. It is this class of cases and those akin to it that the law commits to the decision of a jury. Twelve men of the average of the community, comprising men of education and men of little education, men of learning and men whose learning consists only in what they have themselves seen and heard, the merchant, the mechanic, the farmer, the laborer; these sit together, consult, apply their separate experience of the affairs of life to the facts proven, and draw a unanimous

One way or the other, a duty of care is a prerequisite for the recognition of wrong and subsequently the reparation of damages. Having affirmed the existence of a duty, the court will proceed to the next two stages of analysis which are the beating heart of the ever-evolving chapter of negligence. The breach of duty and the proximate cause. The next two sub-chapters serve, in parallel, as a bridge to the next chapter where I discuss the issues of causality and reasonableness.

Breach of duty

Following the determination of the existence of a duty owed by the defendant, the next challenge for the court and the jury is to consider whether the actions of the defendant, viewed aside to the yardstick of the “reasonable person¹⁶¹”, failed to meet that standard. In this context, things are much more straight-forward, almost as precise as a mathematical equation:

“[T]he owner's duty, as in other similar situations, to provide against resulting injuries is a function of three variables:
(1) The probability that she will break away; (2) the gravity of the resulting injury, if she does; (3) the burden of adequate precautions. Possibly it serves to bring this notion into relief to state it in algebraic terms: if the probability be called P; the injury, L; and the burden, B; liability depends upon whether B is less than L multiplied by P”

This reasoning, developed by Justice *Hand* in the *United States v. Carroll Towing Co.* case¹⁶² has been one of the most influential tests in the entire sphere of tort law¹⁶³. *Posner* embraced this formula and

conclusion. This average judgment thus given it is the great effort of the law to obtain. It is assumed that twelve men know more of the common affairs of life than does one man, that they can draw wiser and safer conclusions from admitted facts thus occurring than can a single judge”);

¹⁶¹ Restatement (Third) of Torts: Phys. & Emot. Harm § 3 (2010) cmt. a (“Conduct that displays reasonable care is the same as conduct that is reasonable, conduct that shows “ordinary care,” conduct that avoids creating an “unreasonable risk of harm,” and conduct that shows “reasonable prudence.” Because a “reasonably careful person” (or a “reasonably prudent person”) is one who acts with reasonable care, the “reasonable care” standard for negligence is basically the same as a standard expressed in terms of the “reasonably careful person” (or the “reasonably prudent person”).

¹⁶² *United States v. Carroll Towing Co.*, 159 F.2d 169, (2nd Circ. 1947)

¹⁶³ See W. Page and Keeton, PROSSER AND KEETON ON THE LAW OF TORTS, *supra* note 11, § 65, at 453-54, cited by *Cardi supra* note 142 (“The unreasonableness of the risk which [reasonable person of ordinary prudence] incurs is judged by the ... process of weighing the importance of the interest he is seeking to advance, and the burden of taking precautions, against the probability and probable gravity of the anticipated harm ”); Richard A. Posner, A Theory of Negligence, 1 J. Legal Stud.

framed it into the wider spectrum of the economic analysis of law¹⁶⁴. Despite the difficulties in the quantification of the variables set in the test, the Hand Formula dominated common law and was incorporated in the *Second* and *Third Restatements*¹⁶⁵. The true value of the formula along with the challenges that courts and juries will have to overcome are both accurately expressed by the Seventh Circuit in *McCarty v. Pheasant Run, Inc*¹⁶⁶:

Ordinarily, and here, the parties do not give the jury the information required to quantify the variables that the Hand Formula picks out as relevant. That is why the formula has greater analytic than operational significance. Conceptual as well as practical difficulties in monetizing personal injuries may continue to frustrate efforts to measure expected accident costs with the precision that is possible, in principle at least, in measuring the other side of the equation—the cost or burden of precaution. (Citation omitted) For many years to come juries may be forced to make rough judgments of reasonableness, intuiting rather than measuring the factors in the Hand Formula; and so long as their judgment is reasonable, the trial judge has no right to set it aside, let alone substitute his own judgment.

29, 32- 33 (1972). For a critic on the Hand formula see Benjamin C. Zipursky, *Sleight of Hand*, 48 *Wm. & Mary L. Rev.* 1999, 1999-2002 (2007); see also Richard W. Wright, *Hand, Posner, and the Myth of the "Hand Formula,"* 4 *Theoretical Inquiries L.* 145, 145-48 (2003).

¹⁶⁴ See Posner *id.* ("Hand was adumbrating, perhaps unwittingly, an economic meaning of negligence. Discounting (multiplying) the cost of an accident if it occurs by the probability of occurrence yields a measure of the economic benefit to be anticipated from incurring the costs necessary to prevent the accident. The cost of prevention is what Hand meant by the burden of taking precautions against the accident. It may be the cost of installing safety equipment or otherwise making the activity safer, or the benefit forgone by curtailing or eliminating the activity.")

¹⁶⁵ *Restatement (Third) of Torts: Phys. & Emot. Harm* § 3 (2010):

A person acts negligently if the person does not exercise reasonable care under all the circumstances. Primary factors to consider in ascertaining whether the person's conduct lacks reasonable care are the foreseeable likelihood that the person's conduct will result in harm, the foreseeable severity of any harm that may ensue, and the burden of precautions to eliminate or reduce the risk of harm;

¹⁶⁶ *McCarty v. Pheasant Run, Inc*, 826 F.2d 1554, (7th Circ. 1987)

A remark should be made at this point regarding foreseeability in the context of the breach of duty. At this stage of analysis, the court posits the element of foreseeability in a broader framework for it does not necessarily take into account the specific wrong that occurred. Contrariwise, blameworthiness at this stage operates in “risk contextualization¹⁶⁷” and is attributed when there is a foreseeable likelihood (or probability¹⁶⁸), assessed *ex ante*¹⁶⁹, that the defendant’s actions or omissions could have been harmful irrespective of the severity of the final outcome¹⁷⁰. The pragmatic relation between the breach of the owed duty and the final outcome is the subject of the “Proximate Cause” stage of analysis.

Proximate cause

“Proximate Cause” is one of the most perplexing concepts in common law. Numerous wrongdoers, a different volume of involvement and even “acts of God” have shaped the landscape of some of the most coincidental yet interlinked course of events that this world has ever seen. Courts have continuously been trying to deal with these cases by linearly unravelling the notion of proximate cause. In this context, the influence of *Dean William Prosser's* oft-cited treatise on torts, *Prosser on Torts*, marked the evolution of the concept. Not surprisingly, although we are aware of its etymological origin¹⁷¹, its definitions still remains elusive. As *Green* describes “[h]aving no integrated meaning of its own, its [the proximate cause’s] chameleon quality permits it to be substituted for any one of the elements of a negligence case when a decision on that element becomes difficult¹⁷²”.

¹⁶⁷ See *Cardi* supra note 142

¹⁶⁸ Cite restatement preference

¹⁶⁹ See Restatement (Third) of Torts: Phys. & Emot. Harm § 3 (2010), Reporter’s note, cmt g (“An interesting feature of the negligence system is that given the inevitable timing of a tort claim—which is filed after harm has in fact occurred—the relevant judgments as to foresight are rendered from what can fairly be called the perspective of hindsight. This obviously introduces the possibility of a hindsight bias into the consideration of the foresight question. Psychologists and behavioral economists have studied and documented this bias, and courts should be cognizant of its existence and tendency to distort judgments” citing Kim A. Kamin & Jeffrey J. Rachlinski, *Ex Post ≠ Ex Ante: Determining Liability in Hindsight*, 19 Law & Hum. Behav. 89 (1995) and Susan J. LaBine & Gary LaBine, *Determinations of Negligence and the Hindsight Bias*, Law & Hum. Behav. 501 (1996) (both describing results of experiments).

¹⁷⁰ See *Dobbs* supra note 162 at 335 (“So if a speeding driver crashes into your living room, the fact that a reasonable person would not have specifically recognized a risk of harm to living room furniture will not assist the driver to avoid liability. It is one of the cluster of harms in a generally foreseeable category, and that is enough”)

¹⁷¹ See Leon Green, *Proximate Cause in Texas Negligence Law*, 28 Tex. L. Rev. 471 (1950) (“As is true of other anglicized Latin phrases like *res gestae*, *mens rea*, *res ipsa loquitur*, *prima facie*, negligence *per se*, libelous *per se*, *caveat emptor*, found in other connections, “*proxima causa*” captured the imagination of the courts, and by its promise of easy decision has led them upon evil days”)

¹⁷² *Id.*; See also PROSSER AND KEETON ON TORTS citing *Green Id.* (“Differences of opinion as to its rightful meanings will not infrequently be found in the minds of

Developed as a shield against the “direct consequences”¹⁷³ doctrine which holds the actor liable for all the consequences of her actions -foreseeable or not- the rationale of the “proximate cause” is premised on the foundational principle of tort law accurately expressed by *Owen*:

“As a matter of corrective justice, tort law appropriately holds blameworthy actors accountable only for harms that they reasonably should contemplate as possible consequences of the wrongful aspect of their conduct”.

Hence, assigning legal liability involves fair and just discrimination among an infinite number of causal candidates. As *Edgerton* explains “a legal [or proximate] cause is a justly-attachable cause; [...] meaning by “just,” not merely fair as between the parties, but socially advantageous, as serving the most important of the competing individual and social interests involved¹⁷⁴”. These thoughts on the just limitations of liability are evident in all the Restatements. Despite the omnipresence of the foreseeability element throughout the development of modern tort law and although the *Third Restatement* includes the notion of foreseeability in its definition of negligence¹⁷⁵, it reformulates the criterion of causality within a novel legal framework with a different title. The “scope of the risk¹⁷⁶”.

even a small group of judges on a single court. Between courts of different jurisdictions disagreement widens infinitely”)

¹⁷³ The Privy Council in the seminal *Overseas Tankship (U. K) Ltd. v. Morts Dock & Engineering Co*[1961] A. C. 388. differentiate these two approaches in a meticulous way to eventually adopt the “risk-standard:

“It does not seem consonant with current ideas of justice or morality that for an act of negligence, however slight or venial, which results in some trivial foreseeable damage the actor should be liable for all consequences however unforeseeable and however grave, so long as they can be said to be direct. [...] A man must be considered to be responsible for the probable consequences of his act. To demand more of him is too harsh a rule, to demand less is to ignore that [sic] civilised order requires the observance of a minimum standard of [sic] behaviour.

¹⁷⁴ Henry W. Edgerton, *Legal Cause*, 72 U. Pa. L. Rev. 211 (1923-1924)

¹⁷⁵ Restatement (Third) of Torts: Phys. & Emot. Harm § 3 (2010):

A person acts negligently if the person does not exercise reasonable care under all the circumstances. Primary factors to consider in ascertaining whether the person's conduct lacks reasonable care are the foreseeable likelihood that the person's conduct will result in harm, the foreseeable severity of any harm that may ensue, and the burden of precautions to eliminate or reduce the risk of harm.

¹⁷⁶ For earlier references to the scope of liability see Robert E. Keeton. *Legal Cause in the Law of Torts* (1963) (“The factors determining that the actor is liable for unintended harm caused by his conduct should also determine the scope of his liability”); For a critic on the different wordings that have been used to substitute the element of foreseeability see *Zipurski* supra note 166 (“The *Restatement (Third)*

In shaping the scope of risk, the Third Restatement proclaims: “An actor's liability is limited to those harms that result from the risks that made the actor's conduct tortious¹⁷⁷”. *Comment d* is explanatory:

“Central to the limitation on liability of this Section is the idea that an actor should be held liable only for harm that was among the potential harms—the risks—that made the actor's conduct tortious. The term “scope of liability” is employed to distinguish those harms that fall within this standard and, thus, for which the defendant is subject to liability and, on the other hand, those harms for which the defendant is not liable”.

Although both the risk standard and a foreseeability test exclude liability for harms that were sufficiently unforeseeable at the time of the actor's tortious conduct, the shift from the former to the latter was neither unintended nor purely semantic¹⁷⁸. On the contrary, comment (j), albeit the acknowledgement of the potential overlapping between the two, states the rationale of distinction clearly:

Although the risk standard in this Section is comparable to the foreseeability standard in actions based on negligence, the risk standard contained in this Section is preferable because it provides greater clarity, facilitates clearer analysis in a given case, and better reveals the reason for its existence [...] The risk standard focuses on the appropriate context[...]A foreseeability test for negligence cases risks being misunderstood because of uncertainty about what must be foreseen, by whom, and at what time.

Thus the objective of this distinction is more hermeneutic rather than normative. Foreseeability does remain an integral part of the quest for the link of causation between the wrongful act and the harm

plausibly complains that the *Restatement (Second)*'s effort to switch phraseology never really caught on, and it therefore rejects the phrase "legal cause". It is ironic that there seems to be little sensitivity to the risks of repeating the exercise of finding a new phrase for the same idea.

¹⁷⁷ Restatement (Third) of Torts: Phys. & Emot. Harm § 29 (2010)

¹⁷⁸ See *Owen supra* note 144 (“Foreseeability's burial deep inside the *Restatement (Third)*'s formulation of proximate cause -itself buried under the label "Scope of Liability" - was no mistake”)

occurred. And with regards to this stage of analysis, the foreseeability examination is distinct to the generally oriented foreseeability element at the breach of duty framework of analysis. In the sphere of the scope of liability, foreseeability pinpoints to specific harm suffered by a specific plaintiff¹⁷⁹. One of the most classic examples to portray a possible outcome of the distinction is given by Illustration 3 of the Third Restatement:

Richard, a hunter, finishes his day in the field and stops at a friend's house while walking home. His friend's nine-year-old daughter, Kim, greets Richard, who hands his loaded shotgun to her as he enters the house. Kim drops the shotgun, which lands on her toe, breaking it. Although Richard is negligent for giving Kim his shotgun, the risk that makes Richard negligent is that Kim might shoot someone with the gun, not that she would drop it and hurt herself (the gun was neither especially heavy nor unwieldy). Kim's broken toe is outside the scope of Richard's liability, even though Richard's tortious conduct was a factual cause of Kim's harm.

As a result, in identifying the existence of a causative link between the wrongful act and the injury suffered, the court and the jury will have to determine:

- 1) the fact the wrongful conduct is a “but-for” element of the harm;
- 2) The foreseeable type of hazards –not the “foreseeable type of harms”¹⁸⁰- that the wrongful conduct generates for a foreseeable plaintiff.

¹⁷⁹ See *Cardi supra* note 142 (“Even where injury of some kind to some person was foreseeable and therefore supports a finding of breach, a plaintiff may fail to survive the proximate cause inquiry where the defendant's actions resulted in 1) an unforeseeable type of injury (citation omitted), 2) an injury occurring in an unforeseeable manner (citation omitted), or 3) injury to an unforeseeable plaintiff.

¹⁸⁰ Although the text Third Restatement may not support such a distinction, *Owen supra* note 150 persuasively argues: “It commonly is said that responsibility requires only that an actor foresee the *type* of harm,” not the *manner* of harm, nor the *extent* of harm. Of interest here is the infelicitous convention in the first usage-type of *harm-of* characterizing as “harm” what usually is meant as “hazard” (or “risk”), an unhappy misnomer that also recurs too frequently in connection with statutory violations and negligence per se. The usage problem with the “risk of harm” expression concerns how narrowly or broadly “harm” is characterized’ since “type of harm” in the proximate-cause context is often really shorthand for “type of *risk* of harm,” meaning type of *hazard*. Yet, mischievously, the “type of harm” phraseology is too easily (and hence too often) misinterpreted narrowly to mean the type of *damage* to person or property.

3) Whether the injury occurred is “enlisted” in the product of the intellectual process of the previous step.

Assuming now that the “student’s injury due to congestion” and the subsequent “medical treatment” and “economic loss for missing classes” are considered to be among the hazards that the use of this smart-systems entails (point 2). Carol’s injury, which was caused directly by the defect of the system (point 1) matches this hazard and thus causality is affirmed.

The goal of the analysis so far has been to find the damages to be recovered by causatively connecting their nature to the initial wrongdoers. Also recall that we are witnessing a trial where Herianna, for herself and on behalf of her daughter, is the plaintiff and our Coder with the School are the defendants. Our analysis hitherto affirms that the denial of access to Carol was a result of negligent performance by our Coder and the School who jointly owed a duty of care not to harm Carol. Consequently, both should be held liable for the personal injury of Carol and the economic loss suffered due to one week of missing classes. Having found that, we are missing one step to reach our verdict. The allocation of damages.

For the sake of the discussion we will hypothesize 1) that the total amount to be awarded to the plaintiff is 100\$ 2) that the injury is divisible and thus defendants are individually and separately liable and 3) that the School was found negligent not to employ a human tasked with constantly supervising the system during “rush-hours” and that this negligence contributed by 3/10 to the ultimate harm. Having ruled out the recourse of applying strict liability rules, we will now turn to our proposal on the apportionment of damages between the agents involved in the functioning of the smart-system.

Reasonableness in the Digital world

The quest for Causality

The analysis heretofore adopted a linear way of reasoning and explanation. If there are particular sub-fields in the entirety of common law that resemble the mathematical way of thinking, then tort law must certainly be among them. But its linearity is precisely the reason behind our conceptual difficulty to “cling” tort law principles to the digital world. We are hard-wired to analyze everything that happens to our ecosystem based on our downstream understanding of cause and effect. The digital world, however, does not always work like that. As *Erin Kenneally* vividly describes: “[e]veryone online is but one click away, [thus] placing all connected users within a reasonably perceived risk. In other words, the pool of foreseeable plaintiffs in the physical world is limited by time, location, and predictable relationships. On the Internet, when those measuring

sticks are removed, the liability chain transforms into a cloud encompassing a torrent of probable plaintiffs¹⁸¹”.

As a result, during the workflow of a smart-system, causality is chronologically and spatially dispersed thus “diluting causation to mere influence¹⁸²”. In that sense, the causative sequence of events within a smart-system cannot be conceptually constructed as a “chain” of consecutive tortious conducts. Even the “causative sequence of events” is incongruous phraseology. Hence, the first rule that this paper suggests is the reformulation of the threshold of causation. When seeking to attach accountability to the agents involved in a smart-system functioning, the legal reasoning should not be incarcerated in the quest for “but-for” tortious conducts to lay the burden of damages, but it should instead focus on visualizing the “stream” of all the potential, even non-tortious, elements that consist the “influential variables of the outcome”. The word “stream” derives from Judge Andrew’s dissenting opinion in the seminal *Palsgraf*¹⁸³ case:

“Each one will have an influence.
How great only omniscience can say. You may speak of a chain, or, if you please, a net. An analogy is of little aid. Each cause brings about future events. Without each the future would not be the same. Each is proximate in the sense it is essential. But that is not what we mean by the word. Nor on the other hand do we mean sole cause. There is no such thing. Should analogy be though helpful, however, I prefer that of a stream. The spring, starting on its journey, is joined by tributary after tributary. The river, reaching the ocean, comes from a hundred sources. No man may say whence any drop of water is derived. Yet for a time distinction may be possible. Into the clear creek, brown swamp water flows from the left. Later, from the right comes water stained by its clay bed. The three may remain for a space, sharply divided. But at last inevitably no trace of separation remains. They are so commingled that all distinction is lost. As we have said, we cannot trace the effect

¹⁸¹ Erin Keneally, “Stepping on the Digital Scale: Duty and Liability for negligent Internet Security”, 26 *LOGIN: Mag. Of Usenix & Sage*, 62, 66 (2001)

¹⁸² Liu Hin-Yan, & Zawieska Karolina, (forthcoming). From responsible robotics towards a human rights regime oriented to the challenges of robotics and artificial intelligence. *Ethics and Information Technology*.

¹⁸³ *Palsgraf v. Long Island R. Co.*, 162 N.E. 99, 99 (N.Y. 1928)

of an act to the end, if end there is. Again, however, we may trace it part of the way”.

Choosing to shift the legal interest from the “causative sequence of events” to the “influential variables of the outcome” is consistent not only with the state-of-the-art computational technology which renders the traceback of an error daunting but also with general principles of law. Firstly, allowing a wrongdoer to escape liability due to our innate inability to measure his initial contribution to the outcome is not in accordance with the principles of fairness. Conversely, holding one defendant entirely liable for an injury to which others also contributed because the plaintiff fails to prove their accurate involvement is bad logic and hard law. Indeed, when a defendant's tortious conduct is not a legal cause of all the harm or when such a relationship cannot be demonstrated, then liability for entire damages or joint and several liability does produce disproportionate and excessive liability¹⁸⁴.

Let's go back to our example and break the homogeneity of our “coder” into parts. The smart-system at bar was designed by Company A to receive data from Company B. Company A has also outsourced the data analysis procedure to Company C. The selection of the data to be used for the training of the model was a decision made by C after general guidelines are given by A. The Machine Learning model was selected by Company B and implemented by Company D. At the end the smart-system was delivered to Company A for testing and deployment. After the accident at issue, Herianna, on behalf of her daughter, asked for access to Carol's data that have been used. It was proved that among others the smart-system must have taken into account data including but not limited to: 1) Carol's common city of origin with the previous attacker 2) Herianna's medical history 3) the fact that mother and daughter attended certain religious ceremonies the day before 4) a google search “Will another 9/11 happen?” and “is suicide the solution?” that were traced back to Herianna's browser's history. No one can say with certainty if any of the above did contribute to the denial of access and if so, what was the influence that each variable cause. However, three things were certain. Firstly, all these variables could have influenced the final outcome. Secondly, there could also be additional proxies that played their part. And thirdly, contrary to the legitimate use of 1), 3) and 4), the use of Herianna's medical history as a variable was independent tortious conduct.

In our example, all the aforementioned elements could have influenced the result and it seems evident that no one of the parties involved is entirely responsible for the damages caused. No variable

¹⁸⁴ Gerald W. Boston, Apportionment of Harm in Tort: A proposed Restatement, 21 U. Dayton L. Rev. 267 University of Dayton Law Review Winter, 1996

could have *per se* caused the denial of access. At the same time, no reasonable person could accurately estimate the exact quantum of each conduct. This is not, however, something unheard-of.

In *California Orange Co. v. Riverside Portland Cement Co*¹⁸⁵, two cement companies wrongfully operate their respective cement plants in such manner that deposits of cement dust, blown toward a neighbouring orange grove, were incrusting upon the leaves of the trees, seriously interfering with their respiration and the formation of the starch foods upon which the tree lives. As a result, the trees became weakened and thus the yield of every tree was greatly decreased. In *Slater v. Pacific American Oil Co*¹⁸⁶ a storm in February 1927, flooded the hills where defendant -only one of a number of contributors to the flow-, was operating his oil well. The rainwater flowed down the range of hills through a ravine, carrying oil, salt, and other hydrocarbon substances that were eventually deposited upon the plaintiff property. In *Partenheimer v. Van Order*¹⁸⁷ the defendant's cow, with some nineteen others, was found in the plaintiff's garden, and the whole damage done by all of the cows was \$20. In *Loui v. Oakley*, a plaintiff injured in a series of automobile accidents, occurring months and years apart, sued the first tort-feasor for all the damages that occurred among the various accidents. More recently, in *In re Pharmaceutical Industry Average Wholesale Price Litigation*¹⁸⁸ multi- district class action was brought by patients, third-party payors (TPPs), benefit plans, pharmacies and governmental entities against pharmaceutical manufacturers, alleging unfair and deceptive trade practices in overpricing of drugs reimbursed by *Medicare*, private insurers, and patients.

The common ground of the aforementioned categories of cases was the admission that an apportionment of damages precisely proportionate was not only impossible but also and primarily, inessential¹⁸⁹. Instead, they all agreed that when measuring the exact

¹⁸⁵ *California Orange Co. v. Riverside Portland Cement Co*, 50 Cal.App. 522, (Cal. 1920).

¹⁸⁶ *Slater v. Pacific Am. Oil Co.*, 300 P. 31 (Cal. 1931)

¹⁸⁷ *Partenheimer v. Van Order*, 20 Barb. 479, (Sup.Court 1855)

¹⁸⁸ *In re Pharmaceutical Industry Average Wholesale Price Litigation*, 582 F.3d 156, (1st Cir. 2009)

¹⁸⁹ See Dean Prosser, "*Joint Torts and Several Liability*", 25 Cal. L. Rev. 413, 439 (1937) ("It has been said that no very exact proof will be required, and that general evidence as to the proportion in which the defendants contributed to the result will be sufficient to support separate verdicts. As a last resort, in the absence of anything to the contrary, it may be presumed that the defendants are equally responsible, and that the damages may be divided equally between them." See also *supra* note 198 ("the jury, or the trial judge if the cause be tried without a jury, should be left to make from the evidence the best possible estimate, and to award the plaintiff compensatory damages for the actionable injury California"); *supra* note

199 ("[a]pplying the rule stated in *California Orange Co. v. Riverside Portland Cement Co.*, *supra*, it would appear that the exact contribution as between several tort-feasors may be difficult of exact admeasurement, and a court may exercise a liberal hand in arriving at a judgment in the matter; yet the court must arrive at the

contribution of several tortfeasors, the court or the jury should use either an adequate test or a liberal hand aiming at the best possible estimate. The Supreme Court of Hawai enunciated this principle in its seminal *Loui*¹⁹⁰ case:

“Determining the extent of damages for which the defendant should answer is not a question of causality in the strict sense but rather a question of policy [citation omitted] We realize that many courts purport to resolve the question of the extent of damages for which a defendant will be held liable by reference to various standards clothed in the raiments of causality. But we do not believe that the proper resolution of the conflicting interests involved in this case is facilitated by invoking the talismanic term ‘proximate cause’. It is no less true today than it was 63 years ago when Mr. Justice Holmes concluded: General propositions do not decide concrete cases. The decision will depend on a judgment or intuition more subtle than any articulate major premise¹⁹¹”.

And proceeded :

“In deciding this case, we must steer a careful course between the Scylla of denying the plaintiff any remedy and the Charybdis of imposing on one defendant all the damages, at least some of which would not have occurred without the independent acts of other persons¹⁹²”.

Focusing on the “influential variables of the outcome” and holding parties accountable according to an estimation of their

judgment from the evidence before it”); see *supra* note 200 (“In the absence of all proof, it seems to me that this is a sensible rule, and that we should infer that the cattle did equal damage, in the absence of any proof as to how much was done by each. The law cannot certainly be so unreasonable as to presume that one cow did it all. The judgments of the county court and justice must be reversed”); see *supra* note 201 (“[h]ere, it is likely that the class-wide harm can be divided and apportioned based on the reasonable assumption that the harm is proportionate to the number of pills sold at the inflated AWP. Defendants bear the burden of demonstrating that the injury is divisible and proving the magnitude of the damages that they caused, through their relevant market share”)

¹⁹⁰ *Loui v. Oakley*, 438 P.2d 393 (Haw.1968)

¹⁹¹ *Id.* Citing *Lochner v. State of New York*, 49 L.Ed. 937 (1905)

¹⁹² *Id.*

involvement in the tortious computational procedure offers three sound benefits. First and foremost, the role responsibility¹⁹³ and accountability of all the agents involved is redesignated. Instead of searching for “who did it?” or “who did what?”, a judge following the “influential variables” method would ask “How much of what you do could have been harmful?”. In such a context, developers are no longer able to invoke the complexity and scalability of the smart-system because they are thereby rendered accountable for their processes around rather than directly linked to the outcome¹⁹⁴. Secondly and relatedly, this method clarifies the origin and order of things. Because there exists the fallacy of assuming that the denial of access is the real tort in our case. This assertion distorts the order of things by mistakenly identify the consequence of the tort as its cause. The real tort lies at the companies’ design choices and coding. Last but certainly not least, apart from role responsibility, this method further reinforces moral accountability since developers will be held responsible only for a computational outcome over which they had or could have had control.

Conversely, there are two main impediments to the implementation of this method. The first obstacle is jurisdictional. The rules regarding the evidence required for the divisibility of the injury vary in different jurisdictions¹⁹⁵. As the *Third Restatement* indicates:

“Whether damages are divisible is a question of fact. A party alleging that damages are divisible has the burden to prove that they are divisible. Whether there is sufficient evidence to prove divisibility is determined by each jurisdiction's applicable rules¹⁹⁶”.

This problem is getting even more troublesome in the event of having a foreign firm involved in the functioning of a smart-system,

¹⁹³ See *supra* note 183

¹⁹⁴ For instance, a data analysis company would be held accountable for the use of postal code as a proxy to a racially discriminative outcome that causes economic loss to a plaintiff without the need for explicit knowledge that this proxy triggered the tortious outcome.

¹⁹⁵ California, Wisconsin, Washington, New York, Hawaii and Florida have adopted some form of market share liability. See for example *Sindell v. Abbott Lab.*, 607 P.2d 924 (Cal.1980); *Collins v. Eli Lilly Co.*, 342 N.W.2d 37, 48-49 (Wis.1984); *Martin v. Abbott Lab.*, 689 P.2d 368 (Wash.1984); *Hymowitz v. Eli Lilly & Co.*, 539 N.E.2d 1069 (N.Y.), cert. denied, 493 U.S. 944 (1989); *Smith v. Cutter Biological, Inc.*, 823 P.2d 717 (Haw.1991); *Conley v. Boyle Drug Co.*, 570 So.2d 275 (Fla.1990); On the contrary other jurisdictions like Missouri, Iowa and Illinois have declined to adopt it. See for example *Mulcahy v. Eli Lilly & Co.*, 386 N.W.2d 67 (Iowa 1986); *Zafft v. Eli Lilly & Co.*, 676 S.W.2d 241 (Mo.1984); *Smith v. Eli Lilly & Co.*, 560 N.E.2d 324 (Ill.1990).

¹⁹⁶ See also *Flemings v. State*, 19 So.3d 1220, (Lou. 2009) (“The proper method of calculating reduction in a damage award for failure to mitigate seems to be an open question in comparative fault jurisdictions where the victim's fault is post-injury”)

e.g. a data analysis company located in India¹⁹⁷. Furthermore, it is by no means self-evident that even an approximate estimation of the parties' involvement to a computational outcome would be feasible. Contrary to the quantifiable character of the jurisprudential examples showed above, the "influential variables" method calls for an estimation based mainly on qualitative elements. Scientific efforts around the explainability in "artificial intelligence" could greatly contribute to this uncertainty. But even absent a specific technique for explaining a smart-system's decision, the division of the injury is a matter for the factfinder. Truth is that twelve individuals of various occupations may not be competent computer scientists able to grasp the technicalities at stake. Yet these twelve individuals are the best solution we have discovered so far to mimic the "reasonable person". Absent a regulatory body and a code of practices, society has to establish the prospect of accountability for the developers of systems that have the potential to affect our lives and cause harm. And I see no apparent reason for not implementing the same standard and asking developers to explain their choices before them.

Having said that, the time has come to exemplify the "influential variables" method to our example. Recall that we have 70\$ to divide to several defendants. According to the general principles of negligence, court found the decision not to involve a human supervising the "No access" decisions as negligent. Moreover, testimonies have brought to light that the outcome was a result of the tortious use of Herianna's medical history as a variable. Added to that, the use of proxies such as the relevant Google search, the religious visit the day before and the city of origin, albeit non-tortious by themselves, they seemed to have played their part in the final outcome. As a result:

1) Company A will be held liable for the design decision not to include a human supervisor to sort denial decisions out quickly.

2) Companies A, B and C will be held liable for processing highly sensitive data. In more detail, Company A will be held liable for negligence for it ought to have known that Company C would select highly sensitive data. Company B will be held liable for negligently giving the opportunity to a third party to commit a tort by granting her access to highly sensitive data. Company C will be held liable for the intentional harm of interfering with highly sensitive data whose use influenced the outcome.

3) Company C and D will be held liable for influencing the final outcome by including three innocent-by-themselves variables.

Quantifying these conducts will not be a simple matter and it will require reasonable wisdom and a liberal hand. During the first such cases and before the main criteria solidified, courts and jurors could recourse to the growing literature on the algorithmic fairness and accountability. Developers, on the other hand, will be called to explain their reasonableness. The more reasonable you are, the less

A possible remedy to the jurisdictional issue could be found through contractual arbitration clauses.

“bad” influence you will have. This “reasonableness” is the point with which I will finish my analysis. One point should be clarified, however, before moving to the next chapter. The notion of “reasonable coder” is not conditioned on the judicial use of the “influential variables” method. Although they are both developed within a fault-based regime, the former can exist independently. Indeed, even if a court decides to implement the regular test of “proximate cause” to prove liability, the affirmation of the foreseeability element will be based on the yardstick of the reasonable person –in our case the “reasonable coder”.

The Reasonable Coder

The reasonable person is a jurisprudential product of judicial imagination. Despite its elusiveness, it has been the most objective criterion that courts have come up in order to secure that law will not favour anyone¹⁹⁸. The current chapter builds on the categorization made by *James Fleming* in his oft-cited article “The Qualities of the Reasonable Man in Negligence Cases”¹⁹⁹. *Fleming* classifies the main human traits and attributes that are usually taken into account when searching for the threshold of reasonableness. Although this analysis is not structured on the same pillars, the elements of Judgment, Knowledge and Skill as classified by *Fleming*, have influenced the present categorization. Hence this chapter will examine the general principles that are likely to cultivate the standard of the “Reasonable Coder”. It should be mentioned from the very beginning though, that this standard as any other standard that was accompanied by the adjective “reasonable” will be never rigid. On the contrary, its normative content will be a product of interdisciplinary research that will evolve hand in hand with the evolution of computational technology. This chapter will not, however, portray the current law with regards to the stage of smart-system’s technological development. Instead, it will focus on establishing four rules that could look “more similar than not” to the way courts will deal with developers in future tort law cases. In the context of this endeavour I group all the elements I consider necessary to form four different definitions without disregarding the methodological leap that this procedure involves. In the end, no matter the delicacy of the various terminological attempts, the prototype of the reasonable coder will be fruit from the tree of prudent reasoning watered by the wisdom of few decent, yet divergent, jurors.

¹⁹⁸ Restatement (Second) of Torts § 283 (1965), cmt c:

Standard of the “reasonable man.” Negligence is a departure from a standard of conduct demanded by the community for the protection of others against unreasonable risk. The standard which the community demands must be an objective and external one, rather than that of the individual judgment, good or bad, of the particular individual. It must be the same for all persons, since the law can have no favorites; and yet allowance must be made for some of the differences between individuals, the risk apparent to the actor, his capacity to meet it, and the circumstances under which he must act.

Know your sphere

Data analysts and machine learning developers have witnessed major changes in their job descriptions during the last decade. The information they are processing is no longer a matter of simple three and four-dimensional taxonomy and order but of dimensionally agnostic statistics²⁰⁰. In a recent article published in *Forbes*, Kalev Leetaru tellingly shapes the shift that occurred during the last fifteen years in the field of Data Science:

“One of the most remarkable stories of the rise of “big data” is the way in which it has coincided with the decline of the denominator and our shift towards using algorithms and workflows into which we have no visibility²⁰¹”.

Indeed, data scientists are being gradually detached from the quality of the datasets they use and, pushed by commercially imposed ethics and deadlines, tend to blindly rely on the tools and the “black-boxes” they receive. However, this shift from statistical soundness to mathematical correctness may have colossal consequences. Companies’ crave for more data and their acceptance on messiness over highly curate and pristine data, cultivate a transpose of focus from causation to correlation. This represents a move away from always trying to understand the deeper reasons behind how the world works to simply learning about an association among phenomena and using that to get things done²⁰².

There is ample evidence demonstrating that our reliance on the computational dynamics of the algorithms can be harmful. Opaque datasets, especially those that are harvested from social media, can

¹⁹⁹ Fleming Jr. James, “The Qualities of the Reasonable Man in Negligence Cases”, *16 Mo. L. Rev. 1* (1951)

²⁰⁰ Chris Anderson, “The end of Theory: the Data Deluge Makes the Scientific Method Obsolete”, *WIRED MAGAZINE*, (2008) available at: <https://www.wired.com/2008/06/pb-theory/> (“Scientists are trained to recognize that correlation is not causation, that no conclusions should be drawn simply on the basis of correlation between X and Y (it could just be a coincidence). Instead, you must understand the underlying mechanisms that connect the two. Once you have a model, you can connect the data sets with confidence. Data without a model is just noise. But faced with massive data, this approach to science — hypothesize, model, test — is becoming obsolete”.

²⁰¹ Kalev Leetaru, “How Data Scientists Turned Against Statistics”, *FORBES*, (March 2019) (“In the era before “big data” became a household name, the small sizes of the datasets most researchers worked with necessitated great care in their analysis and made it possible to manually verify the results received. As datasets became ever larger and the underlying algorithms and workflows vastly more complex, data scientists became more and more reliant on the automated nature of their tools”)

²⁰² Kenneth Neil Cukier and Viktor Mayer-Schoenberger, “The Rise of Big Data”, *FOREIGN AFFAIRS*(May/June 2013)

accurately mirror highly sensitive personal data such as sexual orientation, ethnicity, religious, happiness and use of addictive substances²⁰³. Algorithmic decision-making in employment, fueled with theoretically “clean” data, can still produce discriminatory outcomes against constitutionally protected classes²⁰⁴. For example, an experiment conducted by *Marianne Bertrand* and *Sendhil Mullainathan* echoed an inconvenient truth. “Job applicants with African-American names get far fewer callbacks for each resume they send out”. Equally, algorithmic prediction of future criminal offences has been openly questioned after a survey revealing the “remarkably unreliable” character of its outcomes²⁰⁵. The current listing is not exhaustive.

I can think of no legitimate rationale able to justify why courts should tolerate this ever-widening schism between the statistically sound decisions and the mathematically accurate predictions. The rule of law should not permit deviations from its core principles of accountability and transparency because computational technology is a trade secret, securely kept in a “black-box”. With sufficient evidence available on the potential of data being wrong and an ocean of alternative sources of data to choose from, exercising ordinary prudence in selecting, training and testing your data is imperative. Such a standard would not hold developers accountable for every omission that could have conceivably led to an injury. Demanding from a developer to know every corner of her whole dataset, diminishes the utility of the state-of-the-art computational technology and returns us back to the times were statisticians were the total masters of their small datasets. Conversely, accepting the reality of having data scientists testing only small fractions of a gigantic dataset without having any idea of what the rest of the dataset looks like, would be detrimental for the quality of the systems that we, as society, aspire to develop. The yardstick of “reasonableness” lies somewhere in between.

Proposed definition

The reasonable coder has a solid understanding of what the role of dealing with data entails and what society requires from statisticians in terms of attention, intelligence, knowledge and

²⁰³ Michal Kosinski, David Stillwell, and Thore Graepel, Private traits and attributes are predictable from digital records of human behavior, PNAS April 9, <https://doi.org/10.1073/pnas.1218772110>

²⁰⁴ Solon Barocas; Andrew D. Selbst, Big Data's Disparate Impact, 104 Calif. L. Rev. 671 (2016)

²⁰⁵ See Jeff Larson et al., Machine Bias, PROPUBLICA (May 23,2016), available at: <https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing/>, (“Another example of eProPublica journalists obtained risk scores for more than 7,000 people arrested in Broward County, Florida over a two year period. When checked against what actually happened to those arrested in the study, the algorithm's predictions proved “remarkably unreliable” in predicting who was likely to commit violent crime in the future. For instance, only twenty percent of the people identified by the algorithm as likely to commit a violent crime in the future actually did”)

judgment. The reasonable coder embraces the doctrine of “trust but verify”, performs diligent testing of the data and maintains a solid understanding of the “esoterica” of the data she is dealing with.

Know your neighbour

In one of the most historic decisions of English law, the House of Lords dealt with a case where Ms Stevenson after drinking half of her ginger bear, realized that, apparently, inside the dark opaque bottle the remains of a decomposed snail were floating around. Lord Atkins’s opinion, which is considered ever since the stepping stone of product liability rules not only gives birth to the notion of “duty of care” but also sets the boundaries of proximity for the physical world:

“The rule that you are to love your neighbour becomes in law, you must not injure your neighbour; and the lawyer’s question, Who is my neighbour? receives a restricted reply. You must take reasonable care to avoid acts or omissions which you can reasonably foresee would be likely to injure your neighbour. Who, then, in law is my neighbour? The answer seems to be – persons who are so closely and directly affected by my act that I ought reasonably to have them in contemplation as being so affected when I am directing my mind to the acts or omissions which are called in question”.

Lord Atkins did exceptionally well in defining liability with regards to proximity. What he would say, though, if he lived in the age of cloud computing? Is proximity in the digital world distinct from that of the physical world? *Keneally* sets an interesting illustration:

“[I]n the property-based world, courts would have no trouble finding a chink in the chain of causation when One-Armed Jack sues Acme for leaving its warehouse unattended and unlocked, with the keys in the ignition of its delivery trucks. Acme’s nonfeasance enabled Snidely Whiplash to abscond with the vehicle. In the midst of this transgression, he displaced Jack’s limb as he was exiting his car. The same scenario played out in the Environet entails “r00t Whiplash” routing his activity through 15 different hosts in five countries and storing his exploit on an insecure host at Acme. This program directs a malicious payload at some business one week later, but Victim.com happens to suffer a denial of service (DoS) and business disruption in the course of routing the scripted traffic. In the first instance, society is

not willing to impose a duty on vehicle owners (Acme) to protect persons on the highway from thieves. In other words, since it is not reasonable for Acme to foresee that a thief would be an incompetent driver, Acme could not be a cause of the injury.¹⁸ Applying this rationale to the second scenario, the same decision may be trivially apparent given that the harm occurred well after the insecure incident, in a location far away”²⁰⁶.

Our instinct must be right but is it just, fair and reasonable to impose such a duty of care considering that in distinct spheres the actor does not fulfil the element of control?

The answer to this question resembles the dominant discussion during the early Peer-2-Peer litigation where liability for copyright infringements was going astray within a maze of different entities, jurisdictions and “worlds”²⁰⁷. “Code wars”²⁰⁸ manifest the way courts encountered the rise of P2P networks with the most suggestive takeaway being the conceptualization of the way that physical and digital world interact. That distinction is articulated in two seminal yet contradictory cases and will help our analysis in shaping the context of proximity and control in the contemporary digital (call it “cloud”) environment.

The *Aimster*²⁰⁹ case involved the famous software which was facilitating file sharing between different entities through the Internet. The developer company had no insights on what people were transferring since all messages were encrypted. The Seventh Circuit recognized the importance of “not buying”²¹⁰ arguments that purposefully create and consciously exploit the distinction between what happens in the physical and digital world:

“Encryption fosters privacy, and privacy is a social benefit though also a source of social costs. [...] Encryption is considered critical for widespread adoption of IM [instant messaging] in some industries and federal agencies.” [citation omitted]. Our point is only that a service provider that would otherwise be a contributory infringer does not obtain immunity by using encryption to shield itself from actual knowledge of the

²⁰⁶ See *supra* note 182

²⁰⁷ For a detailed historical review of the P2P litigation see REBECCA GIBLINS, *CODE WARS: 10 YEARS OF P2P SOFTWARE LITIGATION*, 2011

²⁰⁸ *Id.*

²⁰⁹ *In re Aimster Copyright Litigation*, 334 F.3d 643, (7th Cir. 2003)

²¹⁰ *Id.* (“We also do not buy Aimster’s argument that since the Supreme Court distinguished, in the long passage from the *Sony* opinion that we quoted earlier, between actual and potential noninfringing uses, all Aimster has to show in order to escape liability for contributory infringement is that its file-sharing system *could* be used in noninfringing ways, which obviously it could be.”)

unlawful purposes for which the service is being used”.

As a result of this acknowledgement the court shifted the burden of proof to *Aimster* to demonstrate that its service has substantial noninfringing uses. *Gibbins*²¹¹ sums it up nicely: “The Seven Circuit’s response to this case seems to recognize that there are some fundamental distinctions between *Aimster* and predecessor technologies such as the *Betamax* that justified treating *Aimster* differently”. On the other hand, in *Metro-Goldwyn-Mayer Studios v. Grokster*²¹², *Ltd*, the opposite spirit prevailed. Defendants, in that case, managed to code their way out of liability and persuaded the Seventh Circuit of their noninfringing intentions:

“However, Defendants correctly point out that in order to be liable under a theory of contributory infringement, they must have actual knowledge of infringement at a time when they can use that knowledge to stop the particular infringement. In other words, Plaintiffs’ notices of infringing conduct are irrelevant if they arrive when Defendants do nothing to facilitate, and cannot do anything to stop, the alleged infringement[...][N]either Grokster nor StreamCast provides the “site and facilities” for direct infringement”.

The Seventh Circuit was *strict sensu* correct but failed in stepping back and looking at the broader picture. The programmers of Grokster had intentionally unleashed software that was outside their own management and trapped the court in a vicious circle of trying to apply physical world rules in elusive technologies. This mistake was spotted by the Supreme Court which granted *certiorari* and the case was eventually vacated and remanded:

“[N]either company attempted to develop filtering tools or other mechanisms to diminish the infringing activity using their software. While the Ninth Circuit treated the defendants’ failure to develop such tools as irrelevant because they lacked an independent duty to monitor their users’ activity, we think this evidence underscores Grokster’s and

²¹¹ See *supra* note

²¹² *Metro-Goldwyn-Mayer Studios v. Grokster*, 259 F.Supp.2d 1029, (Cal. 2003)

StreamCast's intentional facilitation of their users' infringement”.

These two examples manifest the inadequacy of thinking physically in a digital world. Inside the network, users need to be aware of the potential of proximity with a great number of users. This does not mean that law demands from coders to be “Good Samaritans” and save everyone that has the potential to be harmed. As the two cases demonstrate though, in the digital world proximity and control will not be judged according to the criteria of the physical world. Encryption, for example, in the physical world reassures lack of bias. Yet in the digital world, encryption may blanket “wilful blindness”²¹³. Regarding the opposite side of the element of knowledge, *Fleming* observes: “One of the things a man may know is his own ignorance, and this in itself may often be found to call for precautions against possible but unknown danger. Thus, one who finds himself in a strange dark hallway must take precautions against possible "obstructions to his passage and pitfalls to his feet”²¹⁴. Computer science offers endless sources of tools and best practices that a developer can deploy to enhance her system’s performance or minimize potentially harmful outcome. Law will not specifically demand the use of any tool. What will demand though is justification for the lack of such use.

Proposed definition

The reasonable coder knows that she ought to know that an avoidance of ordinary prudence can affect people who were supposed to rely on her exercising reasonable care.

Know your web

The architecture of a company which launches a smart-system will most likely be a complex web of interconnected sub-companies and teams of developers. Many companies have preferred to contract out a plethora of IT tasks instead of building in-house teams and facilities. Data analytics is the most commonly outsourced task. According to a recent study conducted by Grand View Research, a research firm, the global data analytics outsourcing market is anticipated to reach USD 10,321.6 million by 2025²¹⁵. In another

²¹³ *Id.* (“[w]e also reject Aimster's argument that because the Court said in *Sony* that mere “constructive knowledge” of infringing uses is not enough for contributory infringement [citation omitted]and the encryption feature of Aimster's service prevented Deep from knowing what songs were being copied by the users of his system, he lacked the knowledge of infringing uses that liability for contributory infringement requires. Willful blindness is knowledge, in copyright law”)

²¹⁴ See *supra* note 202

²¹⁵ Data Analytics Outsourcing Market Size, GRAND VIEW RESEARCH, description available at: <https://www.grandviewresearch.com/industry-analysis/data-analytics-outsourcing-market>

survey, Dun & Bradstreet and Forbes Insights²¹⁶, showed that 55% of those surveyed said that third-party analytics partners execute work of higher quality than analytics work completed in-house. Meanwhile, the USA had a shortage of 151,717 people with data science skills in 2017²¹⁷.

Think of the following example. “A” is a data analytics firm in India which has undertaken the task of processing data for “B”, a company that develops smart-health applications. “A” is attacked by hackers and as a consequence, all the personal data of B’s clients are leaked and become public. Assume that B’s jurisdiction recognized and independent tort for breach of confidentiality in the context of wrongful disclosure of medical information²¹⁸. Given the inadmissibility of bringing A to the trial, should the court hold B liable? If your answer is negative, would you change stance if you knew that A had been previously involved in a data-breach scandal which involved a major Big-5 Company? Or alternatively, if A had been a low-quality firm which had been victim of other hack attacks in the past?

Knowledge and expertise are not restricted to the subjectivity of the reasonable person but they expand beyond that to embrace the nexus of relationships that this person creates. This “surplus” of required knowledge is broader in cases where the reasonable person is involved in certain activities. As *Fleming* further argues: “In addition to the knowledge and experience with which people generally will be charged in conducting the ordinary affairs of life, men who engage in certain activities or come into certain relationships with people or things are under peculiar obligation to acquire knowledge and experience about that activity, person, or thing. As it has aptly been put, every man is required to have knowledge of “the quality of his beast”²¹⁹. This does not mean that coders will be held strictly liable for any negligence of their external associates. However, it would be legitimate to expect that developers will exercise reasonable care in choosing which parts of their operation they should outsource and to whom.

Proposed definition

The reasonable coder is aware of the fact that outsourcing tasks does not outsource liability and for this reason, she exercises reasonable care when selecting the outsourced tasks and the people to whom she outsources or on whom she relies.

²¹⁶ “Analytics Accelerates Into the Mainstream”, FORBES (June 2017), available at: https://www.forbes.com/forbesinsights/d&b_enterprise_analytics/index.html

²¹⁷ “LinkedIn Workforce Report, United States, August 2018”, LinkedIn Economic Graph, available at: <https://economicgraph.linkedin.com/resources/linkedin-workforce-report-august-2018>

²¹⁸ See Alicia Solow-Niederman, “Beyond the Privacy Torts: Reinvigorating a Common Law Approach for Data Breaches”, *The Yale Law Journal Forum*, (2018)

²¹⁹ See *supra* note 216

Know your impact

In 1981 and the *Aetna v. Jeppesen & Co*²²⁰ case, an airline insurer sued publisher of instrument approach charts for indemnity for money paid in settlement of wrongful death actions filed by representatives of passengers that were killed in a plane crash. The court held defendants liable by arguing among others that:

“While the information conveyed in words and figures on the Las Vegas approach chart was completely correct, the purpose of the chart was to translate this information into an instantly understandable graphic representation. This was what gave the chart its usefulness this is what the chart contributed to the mere data amassed and promulgated by the FAA. It was reliance on this graphic portrayal that Jeppesen invited”.

In 2016 and the *State v. Loomis* case²²¹, a defendant, who was convicted pursuant to a guilty plea of attempting to flee a traffic officer while operating a motor vehicle without the owner's consent and was sentenced to four years, petitioned for post-conviction relief. Loomis asserted that the circuit court's consideration of a COMPAS risk-assessment at sentencing violated his right to due process. The Supreme Court of Wisconsin, after analyzing the judicial parameters for the appropriate use of COMPAS risk assessment, found that:

“If a COMPAS risk assessment were the determinative factor considered at sentencing this would raise due process challenges regarding whether a defendant received an individualized sentence[...] [T]he record reflects that the sentencing court considered the appropriate factors and was aware of the limitations associated with the use of the COMPAS risk assessment. Ultimately, although the circuit court mentioned the COMPAS risk assessment, it was not determinative in deciding whether Loomis should be incarcerated, the severity of the sentence or whether he could be supervised safely and effectively in the community”.

²²⁰ *Aetna v. Jeppesen & Co*, 642 F.2d 339, (9th Cir. 1981)

²²¹ *State v. Loomis*, 371 Wis.2d 235, (Wis. 2016)

The cases above are distinct in time and field of law but they share an important common trait. They both signify the reliability of an information system as a determinative criterion for allocating accountability. In *Aetna*, the chart's utility resided in the fact that people could rely on it. As such, it was treated by the court to a higher standard. Contrariwise, in *Loomis* the court clearly stated that its decision could have been different had the circuit's court taken into account solely the COMPAS risk assessment. Similarly, the ethos of increasing the degree of accountability in parallel with the degree of invited reliability is reiterated in the *Third Restatement* and mirrors general principles of law²²³. As a consequence apart from exercising reasonable care on whom to rely, reasonable people and in our case reasonable coders will need to be aware of those that rely on them.

Inside the workflow a smart-system, reliance is as multi-layered as its structure. The data scientist relies on the skill and proficiency of the knowledge experts, the designers and data architects who discuss and suggest the most befitting structure for their smart-system. The data analyst relies on the quality and representativeness of the data she receives since as mentioned above, she is only able to handle a small part of it. Equally, the machine learning engineer relies on the data she receives and all the parties involved, rely on the visualization of the information by the former. In the end, the user of the system will rely on the smart-system's guidance.

It is true that not every invitation for reliance sent by a smart-system is equal. There are smart-systems that operate side by side with a human being and are not allowed to decide on their own and others that are completely independent in triggering changes in our physical world²²⁴. Nevertheless, there is also the "inbetween" where smart-systems implicitly cultivate reasonable reliance or even legitimate expectations of absolute reliance. For instance, imagine that the risk assessment tools that spot potential offenders become a daily task in every jurisdiction's police department. Ironically in such a scenario, these tools are likely to generate outcomes that humans will tend to accept mechanically. Correspondingly, the classic example of de facto reliance is the air traffic control. It is hard for us to imagine and even harder for the law to expect that the operator of such a system will ignore the recommendations provided by its algorithms and use her own knowledge and expertise, although she is

²²² See generally Mark P. Gergen, *The Ambit of Negligence Liability for Pure Economic Loss*, 48 *Ariz. L. Rev.* 749 (2006); Daniel McNeel Jr. Lane, *Publisher Liability for Material That Invites Reliance*, 66 *Tex. L. Rev.* 1155 (1988); Mark P. Gergen, *Negligent Misrepresentation as Contract*, 101 *Calif. L. Rev.* 953 (2013); for a description on the concept in Australia see Kumaralingam Amirthalingam, *The Shifting Sands of Negligence: Reasonable Reliance to Legitimate Expectation*, 3 *Oxford U. Commw. L.J.* 81 (2003)

²²³ Although hard-coded, the high-frequency trading algorithms which were used by financial firms to make decisions is a good example. See Yavar Bathaee, *The Artificial Intelligence and the Failure of Intent and Causation*, *Harvard Journal of Law & Technology* Volume 31, Number 2 (Spring 2018)

theoretically charged with doing so should she deems it necessary. Hence, the weight of the invitation for reliance is a question of fact that should be evaluated on a case-by-case basis.

Proposed definition

If a smart-system provides substantial reliance to its user to the extent that it is highly unlikely that the user will ignore the system's guidance, this degree of reliance will be taken into account in determining whether the coder has acted as a reasonably careful person.

Drafting judicial recommendations for embracing advanced decision-making systems and their developers is as difficult as hard-coding music recommendations for Spotify. What is possible though in both cases is to create *nuclei* of ideas and incrementally build on them. This paper reaches its conclusion by supporting that the reasonable coder in every stage of the development process will be aware of her sphere, her neighbour, her web and her impact.

Conclusion

This paper attempted a jurisprudential journey in the ocean of contract and tort law aspiring to offer a roadmap towards the assimilation of the automated decision-making systems into the norms and principles of negligence. Liability ascription has historically followed the evolution of technology. Today, next to the scholarship for the establishment of independent torts for privacy protection and the scientific research on issues of algorithmic fairness and explainability, a new area that calls for the renewal of tort law has emerged. This paper argued that no matter which classification is chosen, the judgment on harms generated by automated decision-making systems will be negligent-based. Added, to this the main assertions that have been made are:

1. the twofold test for determining whether smart-software is “goods” or “services”;
2. the design character of a smart-software defect;
3. the insufficiency of the risk-utility test and its alternative;
4. the extra-contractual duty of care and the professional threshold for computer programmers;
5. the recoverable damages from harm caused by a smart-system;
6. the need for a review of what “harm” means for the purposes of tort law;
7. the “influential variables test” for the apportionment of damages;
8. the ingredients of reasonableness in the world of programming.

Public policy goals are the tissues that connect and cement the regime of negligence. Their reformulation and adjustment to the capacities that automated machines are starting to develop, offers a fertile ground for future research. Hoping that this paper will contribute to the public policy debate, I would like to close this analysis with a question:

Suppose that we are reaching a point of computational evolution where we are finally able to develop machines that –contrary to our fellow human beings- can achieve absolute accuracy in very critical domains such as health, justice, police and education. Are we, as a society, content with that? Or is there something inherently unethical in this?