



Design of a Sustainable and Accessible Royal Rig Maxy Clipper for Single-Handed

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Abstract. The Italian nautical industrial sector has always been an excellence of international level. From 2014 we are witnessing a gradual recovery of the market, after the crash of 2011. The recovery is slow and approaches around 18% uphill. This phenomenon is due to different key factors that refer to the concept and characteristics of the particular products. The first condition is the introduction of new materials and new process technologies. These have allowed the reorganization and optimization of the production system, according to the new needs expressed at global level. Market of maxy and mega yachts is a very fertile field of investigation, both for sailing yachts that motor boats; the interest is expressed thanks to their intrinsic value of “luxury goods”. The results of research in technology and engineering contribute to the choices made by the team designers, who see in the introduction of every possible form of innovation, an added value to the improvement of life on board.

Keywords: Yacht design · Brand identity · Maxy sailing yacht · Customization · One man technologies · Dynarig

1 Introduction

In recent years, economic growth in Europe has maintained a moderate rate. The main causes are attributable to the political uncertainty that has characterized the Community framework, and in particular the condition of some Member States. In Italy, the growth has shown itself in line with the signs of recovery, starting from 2014 to date; the improvement of fiscal policies has favored the maintenance of consumption and household spending, as well as the improvement of company accounts and the implementation of investment projects; the “Industry 4.0” plan¹, substantially contributes to the recovery. The nautical industrial sector benefited from the moderate economic recovery, enhancing the opportunities offered by the export market. The

¹ The first time we talked about Industry 4.0 was at the fair in Hannover (Germany), in 2011. More or less a year later, in October 2012, a group of engineers presented to the German Federal Government what is the first real implementation plan of Industry 4.0, the “Industry 4.0” program.

annual UCINA report² [1], records from 2014 to 2018, that the global turnover of the sector has grown by 18,6%. The Italian context has several factors that influence the market in the nautical field. These range from new productions, to services, to components. A determining factor in stability is represented by trade with foreign countries. The analysis of the main destinations of Italian exports in the shipbuilding sector is carried out on ISTAT [2] data and the Ateco code³ CL3012 “Pleasure and sport boats”. Extra-European countries are still the main destination for Italian sales abroad. Since 2016 there has been a moderate increase in the weight of exports to the Member States of the European Union. The analysis of international trade highlights the importance and successes that Italy has managed to conquer the international markets over the years. Superyacht Market Monitor analysis, realized by Altagamma⁴ e Deloitte⁵ for “Nautica Italiana” [3], highlights the trend in the sector for boat manufacturers over 24 m. From 2012 there has been a steady increase in turnover for exports; starting in 2014, the slight increase in the share of the national market. 2016 was a positive and recovery year for orders of boats exceeding 30 m. The last three years Order Book analysis confirms that Italy is the leading producer country, with particular reference to the motorized maxy sector. The market for large sailing yachts is much smaller than that motor powered; the reason is due to the number of sites certainly reduced and to the contained sailing culture. It is a restricted market which, however, has always shown a happy situation. The observation of the trend’s deliveries of the last decade, demonstrates the crisis. *Superyacht intelligence.com*⁶ [4], analyzed two specific market segments: the first includes units between 30 and 50 m; the second includes vessels over 50 m; the market for large sailing yachts is extremely delicate. In the range of sailing yachts over 50 m, the yards that have delivered at least one yacht between 2006 and 2016 are, undoubtedly, fewer. Between these: Perini Navi; Baltic Yachts; Neta Marine; Royal Huisman; Oceanco; HJB (Holland Jachtbouw); Royal Huisman; Nobiskrug; Dream Ship Victory Ltd. The reasons can be attributed to the fact that the market for max sailing has become too competitive, too expensive and perhaps too complex. A possible answer and direction to follow, its to propose boats that are easier to manage; this option could revitalize the market. Recent projects, as Perini Navi’s Sybaris, Holland Jachtbouw’s Skade, Vitters’ Ahima, Vitters’ Aquijo, the new Royal

² UCINA, Confindustria Nautica is the non-profit Association, which since 1960 represents the industries and companies of recreational boating, works for the development of the nautical sector, promotes the culture of the sea and the development of nautical tourism in Italy.

³ The classification of economic activities ATECO (ATTività ECONomiche) it is a type of classification adopted by the Italian National Institute of Statistics (ISTAT) for national statistical surveys of an economic nature.

⁴ Fondazione Altagamma since 1992 it brings together the companies of Italian high culture and creative industry, recognized as authentic ambassadors of Italian style in the world.

⁵ Deloitte is one of the largest companies in professional services (Audit & Assurance, Consulting, Financial Advisory, Risk Advisory, Tax e Legal) in Italia, dove è presente dal 1923.

⁶ The Superyacht Intelligence Agency represents the industry’s most comprehensive pool of superyacht consultancy expertise. With more than 25 years of experience in data gathering, research and market analysis of the large luxury-yacht sector and a network of over 40,000 contacts, The Superyacht Intelligence Agency is the go-to partner of C-suite executives and key industry stakeholders for data and consultancy projects.

Huisman 81 m confirm this data; other actions, like the application of “human centered design”⁷ principles, can contribute to design and produce highly customized artifacts rich in innovations useful for improving the quality of life on board.

2 The Research

The “Premio di Laurea del Comitato Leonardo” contest is a good opportunity to carry out applied research on this topic. The prestigious recognition established by the initiative of Confindustria Italiana, rewards every year the young and the most innovative Degree Theses in the various sectors of Made in Italy excellence: sport, fashion, jewelry design, mechanics, technological innovation, sustainability, nautical, pharmaceutical, internationalization. The object of the proposed research project, had as its main theme “the design of a sailing boat not exceeding 60 m in length characterized by innovative interior solutions, with the integration in the external design of innovations for the exploitation of solar energy; all designed in harmony with the modern styling for the Perini Navi Group”⁸.

2.1 The Leonardo Committee

The Leonardo Committee [5] was born in 1993 on a joint initiative of Confindustria⁹, ICE¹⁰ and a group of entrepreneurs and men of culture, including Gianni Agnelli and Sergio Pininfarina; the main objective is to promote and affirm the “Italian Quality” in the world. The Committee associates over 160 personalities among entrepreneurs, artists, scientists and men of culture, eager to share this goal of enhancing Italy and its originality through the creation of events of high cultural and economic profile. The Leonardo Committee proposes itself with an active role through many initiatives, such as the awarding of Degree Awards, which recognize the talent of young people, encouraging the University and Industry meeting; the Meetings with the Territory, which promote the comparison and cooperation between the entrepreneurs of the many local realities that bring the Made in Italy in the world, and the participation in international missions. Promoting Italy as a Country System means emphasizing the skills of entrepreneurship, artistic creativity, refinement and culture that are reflected in its products and lifestyle. This is why the Committee has established the Leonardo

⁷ Human-centered design (HCD) [also Human-centred design, as used in ISO standards] is a design and management framework that develops solutions to problems by involving the human perspective in all steps of the problem-solving process. Human involvement typically takes place in observing the problem within context, brainstorming, conceptualizing, developing, and implementing the solution.

⁸ Perini Navi è un cantiere navale italiano con sede a Viareggio, operante nella progettazione e produzione di yacht a vela di lusso fondato nei primi anni ottanta da Fabio Perini. Perini Navi è l'unico cantiere navale al mondo che disegna, sviluppa e produce autonomamente i propri yacht.

⁹ The General Confederation of Italian Industry, also known as Confindustria, is the main representative organization of Italian manufacturing and service companies, grouping on a voluntary basis over 150,000 companies, including banks as well as public companies since 1993e.

¹⁰ ICE: agency for the promotion abroad and the internationalization of Italian companies.

Award, which is assigned, based on the evaluation of a large and qualified Jury, to an Italian or foreign personality who has contributed significantly to affirming and promoting the image of Italy in the world. The name of Leonardo, not by chance, brings to the magical alchemy between art, science and technology: three forms of expression of the intellectual capacity of man that reflect the success of our country at international level.

2.2 Perini Navi Group

The Perini Group [6], is an Italian shipyard world leader in the design and production of maxy sailing yachts; it also operates in the motor vessel segment with the Picchiotti Brand, another ancient Tuscan shipyard dating back to the 1600s, incorporated by Perini Navi itself and now located in Liguria, in La Spezia. The Group proposes a new vision of sailing: *a large ship with ample space and, above all, maneuverable by one man*. A tradition that confined the sailing yacht in narrow spaces and entrusted navigation to the hands of numerous crews. Perini invents the *reel captive winch*¹¹; the application of the new technology allows the group to be the first company capable of producing large boats that can be managed by a small crew. The main technologies introduced are the *Reel Captive Winch*, the *Rig Load Monitor*, and the innovative *Dyna Rig* (Fig. 1).

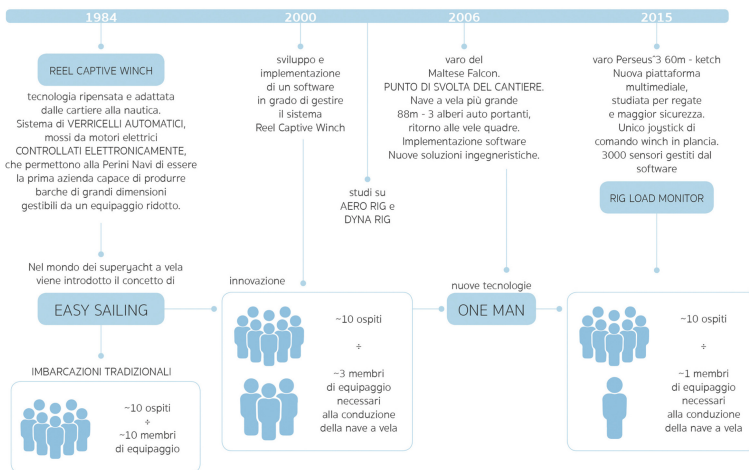


Fig. 1. Perini Group time innovations' timeline.

The application of innovations has allowed the Group, born as a design, engineering and marketing activity for large-sized sailing boats, to become an autonomous

¹¹ a system of automatic winches, driven by electronically controlled electric motors, which is inspired by industrial machinery for wrapping paper.

manufacturer of boats; Introduces the *easy sailing* philosophy, thanks to the design and adoption of computerized systems for handling maneuvers and a series of automations for winding and opening the sails that allow maneuvering the entire sail surface. All sail control systems are developed and built on site, as well as trees and rigging. An exclusive Perini Navi software monitors the performance of the ship under sail and reports the information, via satellite, to the manufacturer's offices. The result is that it is now possible to control boats from 40 to 88 m, with an extremely reduced crew. The building site has always been characterized by a strong research into new solutions and technologies, sometimes purely engineering, aimed at a unique goal: simplify maneuvering and life on board of your sailing ships. Thanks also to the extreme quality of the boats, to their comfort and to the elegance of the interiors, Perini Navi is today the undisputed leader of the megasailer industry; As written by Silvia Pieraccini [7], «Today Perini Navi has the largest production in the world of sailing ships over 40 m». The design, completely carried out within the company, allowed the group to invent and implement its own exclusive technology. The constant commitment to pursuing this goal has decreed the leadership of the shipyard over the years on the global market. The most representative product is the famous and award-winning "*The Maltese Falcon*", icon of Made in Italy in the world (Fig. 2).



Fig. 2. The Maltese Falcon.

3 Concept Design

The design solution described below, considers a multiplicity of aspects, such as: the careful analysis of the nautical market of maxy sailing yachts; the growth factors and mega trends for the nautical industrial sector; the constituent characters of the reference

brand. The competition theme represented the right prerequisite for researching innovative solutions and proposing an original distribution solution for the rooms; a good opportunity to propose new languages for all the aesthetic-morphological aspects of the exterior and interior of the boat, in the respect and correct interpretation of the project brief (Fig. 3).

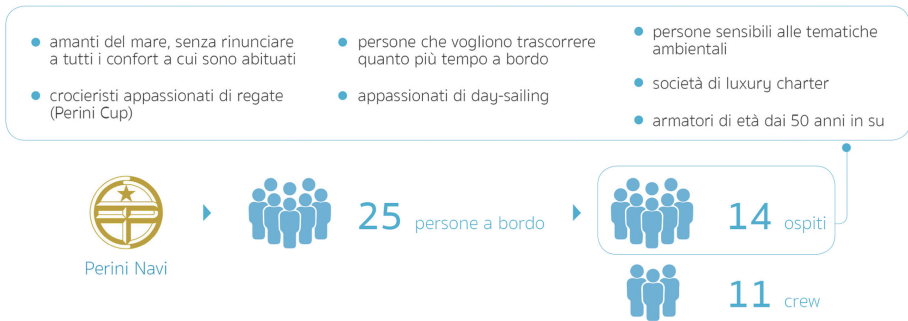


Fig. 3. Design brief.

3.1 Socio-Cultural Trends

The analysis of the nautical market has highlighted a series of different trends among them, and that in recent years have contributed to its recovery: the return of Russian buyers on the market; the growing interest from Asians; the exception of multi-ownership; the charter market as a factor of attraction for new buyers; political instability and the phenomenon of last-minute charter; the search for new itineraries; beach-clubs, must-have for design-features; social, environmental and economic sustainability; simplification.

3.2 Technological Trend

The introduction of new technologies represents a clear aspect of competitiveness: hydraulic system for sail trimming; carbon fibre mast; simplified sailing system (self-tacking jib, swept-back spreaders, no running backstays, manoeuvring dedicated area); performance lifting keel; skylight; flexibility of the interiors and deck; magic trim; interior layout with master cabin forward and crew-service area aft; inside-outside living space; deck layout with social area completely separated from the manoeuvring areas; open cockpit in cruising yachts; push-button system to trim the sails; aft deck layout with XL social area and owners' private cockpit; terrace-on-the-sea; aluminum and carbonfiber building technology for cruising yachts; metallic colours; pure solar-powered luxury.

3.3 User Needs

This type of boat is designed for a small pool of users: sea lovers who do not like to give up all the comforts they are used to; cruise enthusiast cruisers (Perini Cup) [8]; people who want to spend as much time on board; day-sailing enthusiasts; people sensitive to environmental issues; luxury charter company; ship owners aged 50 and over. This dyna-clipper can host a total of 25 users: 14 guests and 11 crew members (Fig. 4).

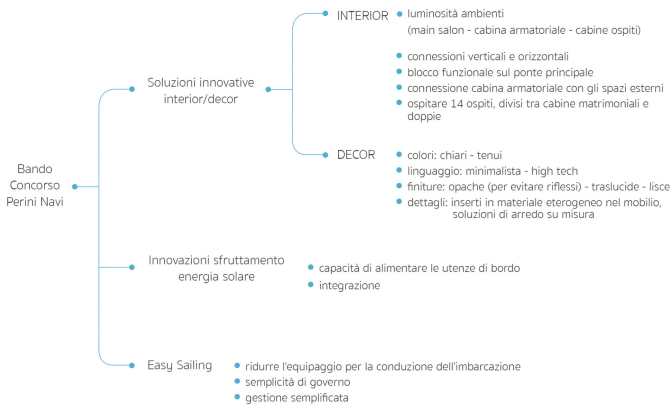


Fig. 4. User needs table.

3.4 Product Requirements

This concept offers innovative solutions for interior design, interior decoration and soft decor; search for the brightness of the main rooms, in the main saloon, in the master cabin, in the guest cabins; optimization of vertical and horizontal connections; organization of a single functional block on the main deck central part; research of the direct relationship and connection between master cabin and outdoor spaces; accommodate 14 guests, divided between double and double cabins. Decor is characterized by the use of light and soft colors; prevalence of a language combined between minimalism and high tech; opaque finishes, to avoid reflections; translucent and smooth surfaces for details; refinement in detail, with the insertion of inserts in heterogeneous material in the furniture; custom furniture solutions; ability to feed on-board users with renewable energy; crew reduction for boat management; easy sailing (Fig. 5).

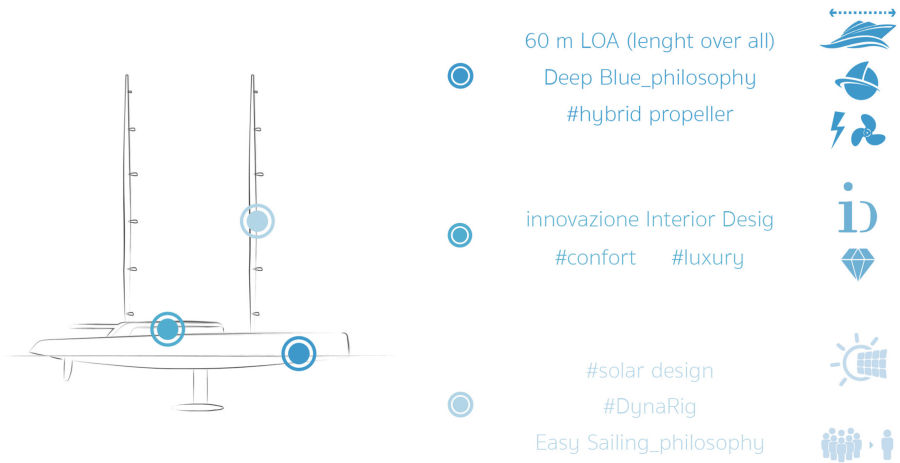


Fig. 5. Product requirements' table.

4 Royal Rig Clipper

Royal Rig Clipper, is the concept of a 60 m sailing yacht, designed according to the philosophy of the Brand Perini Navi; RRG concept is a highly technological boat, designed for easy operation and to ensure extreme comfort for owners and their guests. At the same time, it presents innovative solutions in interior design that integrate innovations for solar energy exploitation and interior design; original design solutions allow the assisted management of functions and connection systems between different bridges. The concept brief can be summarized with the following key words: deep blue philosophy; hybrid propulsion; innovation in interior design comfort; luxury; solar design; easy sailing philosophy; dynarig systems (Fig. 6).

4.1 Interior Design

An innovative distribution layout has been designed and proposed, after a thorough analysis of the brand guidelines, and maxi yacht market offerings; an interesting interior design and interior decoration solutions has been proposed. The main features

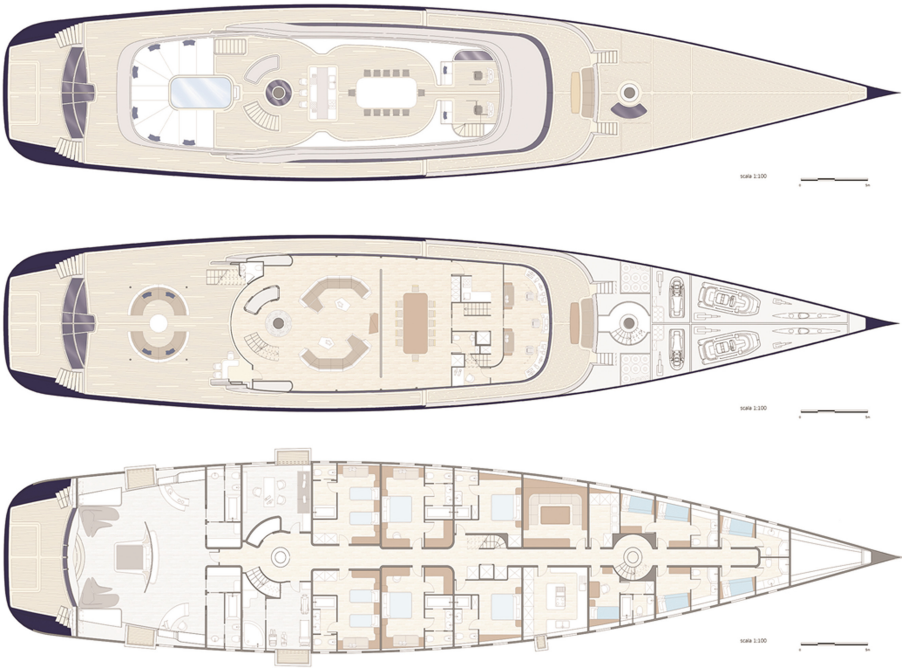


Fig. 6. General arrangements.

can be described such as: brightness of the cabins; optimization of vertical and horizontal connections; introduction of functional block on the main deck; direct connection of master cabin with the external spaces; accommodation for 14 guests, divided between double and double cabins; soft and slight colors for furniture; minimalist language with high-tech contaminations; opaque finishes, to avoid reflections; detail inserts translucent, smooth, and in heterogeneous material; customization and free-standing for living spaces (Figs. 7, 8).



Fig. 7. Main saloon view.



Fig. 8. Owner's cabin view.

4.2 Exterior Design

The exterior design proposes the typical Perini “fashion plate” in a simplified, plastic and modern key. On the technological point of view, the innovations introduced concern the facilitated clipper rigging by the adoption of Dynarig system; the exploitation of solar energy, thanks to the introduction of the solar sail cloth, which can guarantee the capability to feed onboard integrated systems; an elevator puts in direct communication the three bridges of the ship. Particular attention has been paid to the owner’s cabin, which presents a series of services and a direct connection with the stern terrace on the sea and the openings to the sea directly inserted into the bulwarks (Fig. 9, 10).



Fig. 9. Royal Rig Clipper exterior overview

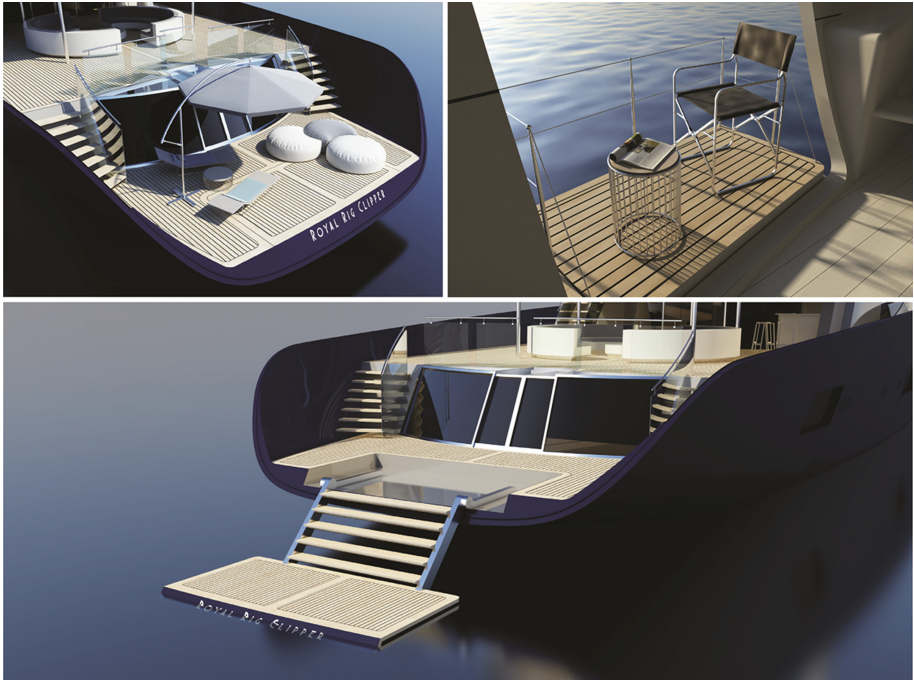


Fig. 10. Royal Rig Clipper stern configurations overview.

5 Conclusions

New modalities define new ways of thinking that are measured with different lifestyles. The design solutions push in favor of an always higher level of flexibility and product customization; a condition related to the ability of managing the principles of ergonomics; principles strictly closed to the needs of users, such as the search for maximum simplification in the management of activities, even if applied to large sized products, multifunctional, and therefore extremely complex. This paper presents the results of a research on the theme of innovation for the design of the nautical product conducted at the Department of Architecture of the University “G. d’Annunzio” of Chieti-Pescara (Italy). The starting point is given by the objective condition that the introduction of new technological factors can generate advantages and benefits for a correct use of living spaces in movement. The proposed design research starts from the reading and interpretation of the distinctive and stylistic features of a worldwide Brand leader in the production of maxy sailing yachts, and proposes a modern interpretation of the linguistic codes mediated by the use of the most sophisticated process and management technologies aimed at improving on-board ergonomics and generating a better condition of use of the good by users.

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D'Onofrio, candidate: Luca Mincarini), edited in the "*Interior Design of Sustainable Living*" Degree Laboratory, at the Department of Architecture of the University of Chieti-Pescara (Italy). All the images reported in this paper are taken from the above mentioned M.Sc. Thesis. The development of the research referred to the concept design of a maxy sailing yacht for Single-Handed sailors, according to new production processes and new technological solutions, useful for the development of a new multifunctional and high customizable nautical concepts. The research was conducted directly from the M.Sc. candidate Luca Mincarini under the guide of Prof. Massimo Di Nicolantonio. The various paragraphs of the present paper can be considered the consequence of a common discussion and a review of the author. In particular, the writing of the various paragraphs can be Attributed to Massimo Di Nicolantonio.

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