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Schools of thought and industrial revolutions: the multidimensional evolution of value creation

Courants de pensée et révolutions industrielles : l'évolution multidimensionnelle de la création de valeur

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Abstract
The present article presents a multidimensional viewpoint on the concept of value creation and proposes a new classification of schools of thought on value creation into four periods that correspond to the first four industrial revolutions. It elucidates the historical evolution of the concept of value and its dynamic adaptation to economic, social, and technological changes. The literature on various definitions of value and typologies of value creation is reviewed, underscoring the significance of sustaining value creation over time. A comprehensive perspective on value creation is provided by demonstrating how schools of thought on value creation have evolved and influenced how corporations offer valuable products and services to their consumers.
Moreover, the need for a synthetic discourse and a unified theoretical articulation among various management science disciplines to facilitate a better understanding of value creation is emphasized. It is posited that value creation is a complex and multidimensional concept that necessitates an exhaustive analysis to comprehend all its subtleties. The conclusion drawn is that the conception and creation of value vary according to disciplinary perspectives and that a deep understanding of value creation is indispensable to thrive in today's dynamic and competitive business environment.

Keywords: Value creation; Industrial revolutions; Schools of thought; Typologies of value creation; Industry 4.0.

Résumé
Cet article présente un point de vue multidimensionnel sur le concept de création de valeur et propose une nouvelle classification des écoles de pensée sur la création de valeur en quatre périodes correspondant aux quatre premières révolutions industrielles. Il éclaire l'évolution historique du concept de valeur et son adaptation dynamique aux changements économiques, sociaux et technologiques. La littérature sur les différentes définitions de la valeur et les typologies de création de valeur est examinée, soulignant l'importance de maintenir la création de valeur au fil du temps. Une perspective globale sur la création de valeur est présentée en montrant comment les écoles de pensée sur la création de valeur ont évolué et influencé la façon dont les entreprises offrent des produits et services de valeur à leurs consommateurs.
De plus, l'article souligne la nécessité d'un discours synthétique et d'une articulation théorique unifiée entre les différentes disciplines de la gestion pour faciliter une meilleure compréhension de la création de valeur. Il est avancé que la création de valeur est un concept complexe et multidimensionnel qui nécessite une analyse exhaustive pour comprendre toutes ses subtilités. La conclusion tirée est que la conception et la création de valeur varient selon les perspectives disciplinaires et qu'une compréhension approfondie de la création de valeur est indispensable pour réussir dans l'environnement commercial dynamique et compétitif d'aujourd'hui.

Mots clés : Création de valeur ; Révolutions industrielles ; Écoles de pensée ; Typologies de création de valeur ; Industrie 4.0.

Introduction

At the heart of all economic activities lies the creation of value, which allows companies to meet their customers' needs and expectations while maximizing their profitability. However, this perpetual quest for value creation cannot be approached statically. It is constantly evolving in response to economic, social, and technological changes. In fact, the concepts of value and value creation are frequently discussed both in the financial and management departments of businesses.

In this article, we aim to demystify this concept by considering value creation as a multidimensional notion rather than a simple monopoly. We will also zoom in on the different phases of evolution of the various schools of thought that have supported value and its creation. To do so, we will begin with a review of the literature on the different definitions of value and typologies of value creation according to various fields. We will then detail our innovative classification of schools of thought on value creation into four periods, corresponding to the succession of industrial revolutions from 1.0 to 4.0. This classification will highlight the strength of industrial movements and evolutions in the conceptualization of value throughout history. Thus, our article proposes to offer a holistic perspective on value creation, showing how schools of thought on value creation have evolved in response to changes brought about by the industrial revolutions, and how these changes have influenced the way companies conceive of and offer valuable products and services to their customers.

Background

Value creation has become an obligation for various actors, regardless of their fields of activity. Moreover, the omnipresence of this concept in the entrepreneurial sphere as well as the emergence of the intangible era have led many researchers to examine the question of value creation in this new context by attempting to define it and seeking different conceptualizations of it. At this level, it is necessary to take into consideration the philosophical background of the notion of value and its creation, which confronts the researcher with multiple meanings and controversies, notably the distinction between exchange value and use value. Indeed, these two notions have been widely debated since the era of the Physiocrats up to the classical and neoclassical schools of thought with their founding fathers, such as Smith (1776), David Ricardo (1817), Say (1821), Walras (1874), and Marshall (1890). This evolution of schools of

thought on value creation is closely linked to the evolution of industrial revolutions. The first industrial revolution (IR 1.0) is characterized by the introduction of mechanical production, and value was mainly created through mass production and economies of scale. The second industrial revolution (IR 2.0) brought about the introduction of electricity and the assembly line, and value creation focused on standardization and cost reduction. In the third industrial revolution (IR 3.0), the introduction of computerization and automation led to the creation of value through customization and flexibility. Finally, the fourth industrial revolution (IR 4.0) is characterized by the integration of technologies such as artificial intelligence, the internet of things, and big data, leading to value creation through digitalization and platformization.

This complex and polysemic notion can be approached from different angles. According to Derrouiche & al. (2012), it encompasses several dimensions and does not occupy the same place in economic sciences as it does in management sciences. Value creation has been studied in various disciplines, such as finance, accounting, management control, strategic management, production management, human resources management, and marketing. However, Bréchet & Desreumaux (1998) emphasize the absence of a synthetic discourse and a common theoretical articulation between the different disciplines in management sciences. With regard to typologies of value creation, there are several approaches. According to Spulber (2007), value creation can be classified into three categories: value creation for the customer, value creation for the company, and value creation for the firm. Other authors, such as Barney and al. (2011), emphasized the importance of the temporal dimension of value creation, highlighting the need to maintain value creation over time.

Thus, we can say that value creation is a complicated and multidimensional concept that requires in-depth analysis to understand all its nuances. The conception and creation of value vary according to disciplines, with two perspectives of value creation identified by Bréchet and Desreumaux (1998): production conception, considering the company as a production unit, and exchange conception, considering the company as a structure based on contractual notions. Management sciences consider the production process as the creation of products of higher value than the original inputs, with tangible resources considered as transforming resources and intangible resources considered as transformed resources. Each management science discipline approaches value creation from a partial perspective that does not integrate all stakeholders in the company, with priority attention given to a specific stakeholder depending on the discipline.

As a result of globalization and the rapid industrial revolutions, the concept of value has undergone significant conceptual changes. By examining how various schools of thought on value creation have evolved in response to these changes, we can gain a better understanding of the complexities of this concept and the difficulties companies face in creating and capturing value.

Research question and methodology:

In this study, we seek to examine the evolution of schools of thought on value creation in response to the changes brought about by industrial revolutions. Specifically, we want to explore how these changes have influenced the way companies conceive and offer valuable products and services to their customers. Our research question is: How have schools of thought on value creation evolved in response to changes brought about by industrial revolutions and how have these changes influenced the way companies conceive and offer valuable products and services to their customers?

To answer this question, we have adopted a literature review research approach. This approach involves analyzing existing literature to identify the various typologies and aspects of value creation. To contextualize this evolution, we have utilized a variety of sources, including both ancient and modern writings. While some of our sources may be old, they remain relevant for understanding the roots of thought on value creation, while more recent sources have been included to reflect the latest developments in this exciting field. By reviewing relevant literature, we can gain a comprehensive understanding of the evolution of schools of thought on value creation and how these schools of thought have been influenced by industrial revolutions.

Through our literature review research approach, we aim to provide a detailed analysis of the evolution of schools of thought on value creation and how these changes have influenced the way companies conceive and offer valuable products and services to their customers. We hope that our findings will contribute to the existing body of knowledge on value creation and provide insights for companies seeking to adapt their approaches in response to changing market conditions.

1. Value creation, a multifaceted concept in management sciences

1.1. Exploring the Complexity of Value Creation in Management Science

This is where the definition of value, as proposed by Bourguignon (1998), becomes relevant. Bourguignon's definition of value provides a basis for understanding the different dimensions of value creation, including the **value in the sense of measurement** that applies to direct sciences such as mathematics and physics. Secondly, **value in the economic sense**, which has evolved and branched out to reach several disciplines, according to economic schools of thought and new ideas. Finally, **value in the philosophical sense**, often used in the plural form, revolves around the notions of "good" and "bad", and is called "axiology" in philosophy, referring to both the science and theory of values (De Lastic, 2011). However, Bourguignon's approach may not be comprehensive enough to fully grasp the complexity of value creation in management science. Other important dimensions of value creation, such as social and environmental impact, may not be fully captured by these definitions. This definition is interesting because it highlights the complexity and polyvalence of the concept of value in management science. Nonetheless, value cannot be reduced to only three meanings, as other important dimensions of value, such as social and environmental impact, are not fully captured by these three meanings. Furthermore, the division into three categories is too simplistic and does not reflect the complexity of value creation in modern organizations. Finally, it is not relevant to distinguish between economic and philosophical value, as these two notions are closely linked and cannot be separated in such a clear-cut way. In summary, while Bourguignon's definition of value is useful and informative, it could be improved and refined to better capture the complexity of value creation in management science.

For instance, Saussure (cited in Bordron, 2011) explained that value resides and is constituted by the double action between exchange and comparison, regardless of the field. This highlights the importance of considering the exchange and comparison aspects in defining value. Determining the value of something requires the possibility of exchanging it for a different thing and comparing it with a similar value in the same or another system. This applies not only to linguistics, where words can be compared with each other and exchanged for different ideas, but also to management science, where the exchange and comparison of goods and services play a crucial role in determining value. Therefore, a more comprehensive definition of value in management science should take into account the exchange and comparison aspects. While

Bourguignon's definition of value is useful and informative, it could be improved and refined to better capture the complexity of value creation in management science by including these exchange and comparison aspects.

The notion of value and its generation are subject to variation across various disciplines. Within this framework, it is noteworthy to highlight the observations of Bréchet & Desreumaux (1998) regarding value creation through the convergence of diverse fields within management science (Table 1). By breaking down the management processes into three distinct phases, namely design, operations management, and value allocation, distribution, and capture, they were able to establish two perspectives on value creation: **production design**, which regards the firm as a production unit, and **exchange design**, which regards the firm as a contractual structure.

Table 1 - Contribution of management sciences to the theme of value

	Value management process		
Disciplines	**Design**	**Operations management**	**Allocation, distribution, and capture of value**
Production management	- Conception of the manufacturing process and the value chain. - Foresight on the value of technologies.	- Organization and scheduling of production operations. - Control of costs, deadlines, and quality. - Value analysis.	- Negotiation of procurement and partnership relations.
Finance	- Prospective analysis of the value of business projects. - Ex-post evaluation of results.	- Procurement of financial resources. - Management of financial assets, arbitrage..	- Allocation of results. - Profit sharing, financial incentives.
Marketing	- Knowledge of markets and customers. - Search for positioning. - Design of the marketing mix.	- Control of the costs and quality of commercialization.	- Commercial negotiation.
Human resources management	- Preservation and development of the value of human resources.	- Procurement of human resources. - Mobilization of personnel.	- Financial and non-financial incentives.

Strategic management	- Definition of a strategic positioning. - Development of a vision, a value-creating project.	- Management of the interface between strategy and operations. - Strategic steering. - Integrated planning.	- Arbitrations in the value chain
Accounting / Control	- Management of the interface between the value given by the market and the value creation processes (target-costs).	- Measurement/evaluation of costs and results. - Monitoring of progress.	- Contribution to the management of performance remuneration (related to physical or financial results).
Administrative management	- Conception of the governance mode.	- Conflict management.	- Procedures for employee incentives.

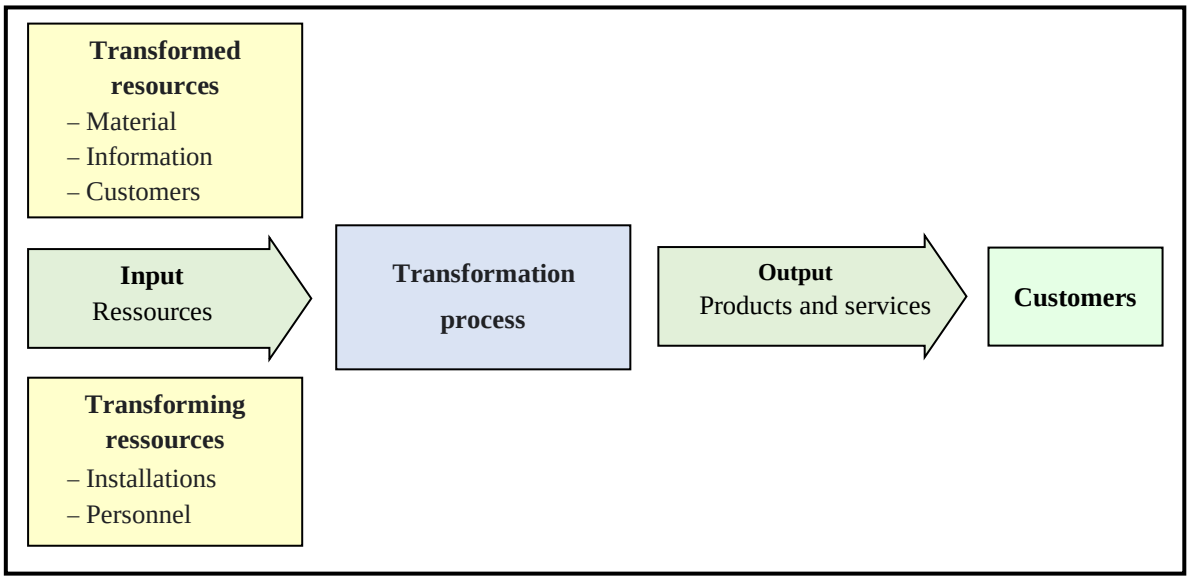
Source : Bréchet & Desreumaux (1998)

It appears that management sciences follow the same economic approach as the theory of production, considering the production process as the creation of products with higher value than the original inputs (Frisch, 1965). This means that production is a key element in creating value for organizations.

Inputs may include tangible raw materials such as equipment, information, and personnel. Generally, tangible resources are considered transforming resources while intangible resources are considered transformed resources (Slack & al., 2010). Typically, organizations combine both types of resources, but with transformation and production processes tailored to the nature of the products and services (Figure 1 below).

For example, professional services such as lawyers or accountants use their clients and information as inputs, their experience and knowledge as transformation processes, and the result is high-quality advice. In contrast, an engineering company will use a combination of raw materials, equipment, and people, as well as intellectual inputs such as innovative research and design, requiring a more complex series of processes to create a finished product for an end-user. However, what is common in both cases is that organizations have control over the unique transformation process to generate inherently valuable value that helps them stand out in a competitive market.

Figure 1 - The input-transformation-output process



Source: Slack & al. (2010)

The second remark that these three authors could draw from this contribution table is that each discipline of management sciences has approached value creation from a partial point of view that does not integrate all stakeholders of the company or at least the majority of them and that privileges a specific part to the detriment of others. This can be justified by the stakeholder's position in terms of their power, legitimacy, and urgency (De Bry & Galindo, 2005; El Abboubi & al., 2008). For example, the stakeholder who possesses the cumulative number of the three attributes will have authority and receive priority attention from the company in terms of value creation to avoid any dissatisfaction, but unfortunately, companies tend to neglect this point.

At this level, one of the most classic models is Porter's (1980), in which five types of stakeholders are retained, namely suppliers, customers, competitors, threats of new entrants, and the threat of substitute products. These actors have been considered as threatening forces of the company that must be transformed into advantages. On the other hand, the combined weight of the forces of these stakeholders allows the company to determine the attractiveness of its business sectors and to react in an effective and efficient way to ensure value creation through competitive dominance.

1.2. Different typologies and aspects of value creation

One of the most cited and encountered typologies in the literature is Holbrook's typology (1999), which focuses on customer value and revolves around three dichotomous criteria:

- **"Active" vs. "reactive" orientation:** This dimension relates to the degree of interaction with a product or service. When it is the object that has an effect on the individual, we speak in this case of reactive value resulting from a consumer's reaction to an object; transformation of the subject by the product. On the other hand, active value is the result of an action taken by a consumer towards a product or service, hence the distinction between "physical manipulation" and "mental manipulation" of a tangible or intangible object. Thus, it can be observed that the interaction between the consumer and their environment is a value creator.
- **"Intrinsic" vs. "extrinsic" orientation:** A value is said to be extrinsic when consumption is valued according to its function and usefulness as a means to an end. Whereas in an intrinsic orientation, consumption is an end in itself.
- **"Self-oriented" vs. "other-oriented" orientation:** This dimension takes into account the consumer's social experience. Indeed, the interpretation of the contribution of the consumption experience in an egocentric way by the consumer is called self-oriented. Whereas a value-oriented "towards others" is characterized by the consumer's interpretation focused on the contribution of the consumption experience to their environment (family, friends, society, nature, etc.).

Most often, it is the extrinsic attributes that explain consumers' choices of products and services that have prices higher than their generic equivalents (Simpson & al., 2001). It is by crossing these three dimensions that Holbrook M. was able to identify eight forms of value illustrated in Figure 2 below:

Figure 2 - Holbrook's typology of value

		Extrinsic Economic Value	Intrinsic Hedonic Value
Self-oriented	**Active**	Efficiency [I/O ratin]	Play [Fun & Leisure]
	Reactive	Excellence [Quality]	Aesthetics [Beauty]
		Social Value	**Altruistic Value**
Other-Oriented	**Active**	Statut [Impression]	Éthics [justice / Morality]
	Reactive	Esteem [Possessions]	Spirituality [Sacredness]

Source: Holbrook M. (1999) (adapted from Holbrook 2006)

- **Efficiency (individual, extrinsic, active value):** reflects the utilitarian nature of consumption, and is the result of the trade-off between the most advantageous cost/benefit and quality/price ratio of the products offered.
- **Excellence (individual, extrinsic, reactive value):** gratification is added to the instrumental character of consumption to give rise to a reactive and personal evaluation of the ability of the offer to go beyond mere efficiency towards a specific luxury.
- **Status (social, extrinsic, active value):** expresses the ability of the product, service, or consumption experience to build a social position for the consumer in the eyes of others.
- **Esteem (social, extrinsic, reactive value):** refers to the passive acquisition of a valuable asset for its holder thanks to its symbol in a determined cultural context or its social image.
- **Play (individual, intrinsic, active value):** is illustrated by the pleasure derived from the active manipulation of the product or service without having another objective to pursue.

- **Aesthetics (individual, intrinsic, reactive value):** corresponds to the personal appreciation of the aesthetic value and beauty of an offer or the place of its exhibition, such as in the case of works of art.
- **Ethics (social, intrinsic, active value):** refers to the search for the procurement of an ethical objective through consuming a product; an intrinsic end of active nature, but oriented towards others.
- **Spirituality (social, intrinsic, reactive value):** corresponds to an intrinsic motivation that drives the consumer to access the search for a transformation through a consumption experience in order to acquire the appreciation and adoration of others.

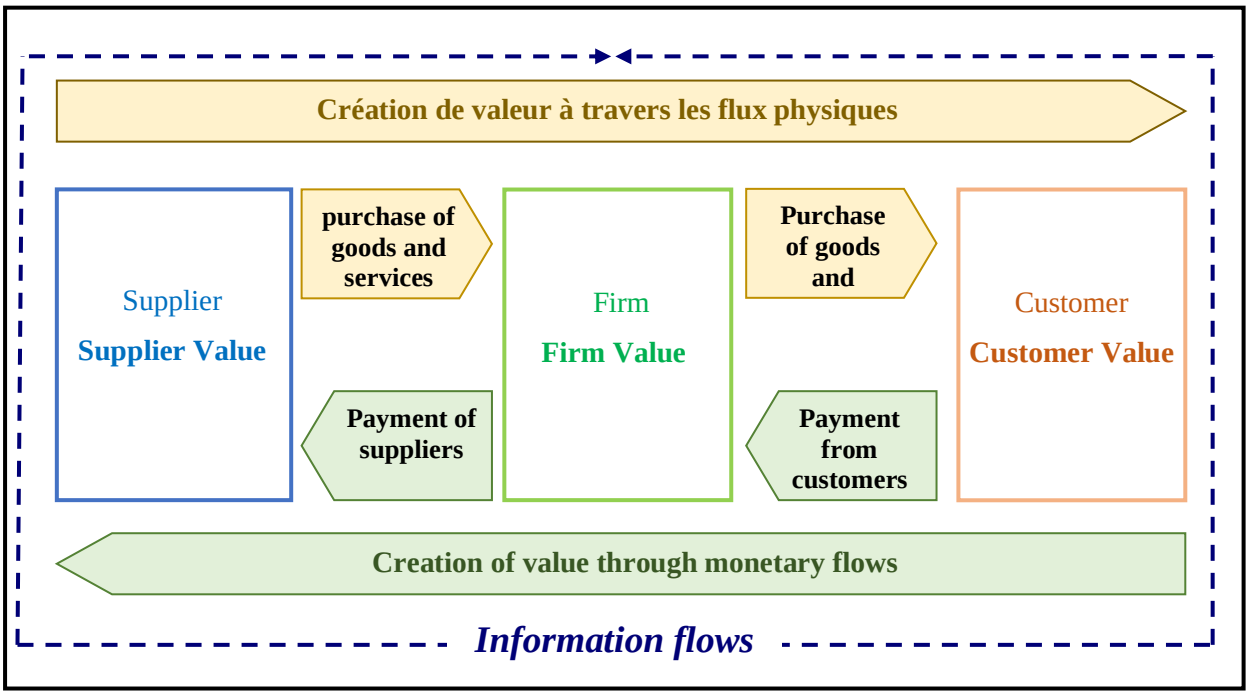
Holbrook's typology (1999) has been strongly criticized by Cova & Rémy (2001) and Badot (2001) for not being exclusive or exhaustive. It is not exclusive because the boundaries separating the different types of value are confusing, even ambiguous, making it difficult to classify them clearly. It is not exhaustive since it does not include other types of value such as epistemic value. As a result, Holbrook (2006) further classified these eight types into four broad categories of value. Economic value comprises of efficiency and excellence, while hedonic value encompasses play and aesthetics. Social value pertains to status and esteem, while altruistic value includes ethics and spirituality.

Regarding Spulber (2007), there are three main components of value, namely customer value, supplier value, and the value of the firm. Customer value is the net profit realized by the customer, taking into account the expenses incurred to acquire a product. Supplier value corresponds to the revenue earned by the supplier, net of the costs incurred. On the other hand, the value of the firm is the share of the value created and captured by the company.

The typology presented in this study has a strong connection with the two key partners of a company, namely suppliers and customers. The exchange of physical, monetary, and information flows between the company and these partners creates value and allows for the classification of the company into three main categories. The first category is customer value, which refers to the value created by the company for its customers, as well as the value created for the company by its customers. The second category is supplier value, which refers to the value created by the company for its suppliers, as well as the value created for the company by

its suppliers. Finally, the third category is firm value, which is the sum of the value created by the company through its customers, suppliers, and other stakeholders not mentioned in this model. However, customers and suppliers remain crucial to the value creation process, and their absence can cause it to halt. A visual representation of this typology is provided in Figure 3 below.

Figure 3 - Company flows and value components



Source: Authors

Moreover, the goal of any business is to create added value through the production of final products and services using incoming products and services. The ultimate destination of the final products and services is the customer who creates value through the marketing process handled by the company and the price demanded by the market.

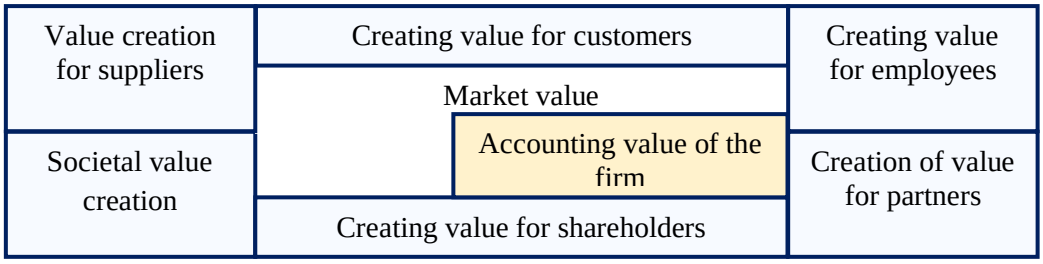
Thus, the flows that govern the relationship between the company and its customers and suppliers are essential and basic generators of value in the process of creating organizational value. It should be noted that information flows have experienced excessive growth to the point of becoming a pillar of support for physical flows to become a creator of its own added value and the pivot of the creation of the company's value (Jobin & Friel, 2000).

As value can be apprehended differently depending on the perspective of the company or the customer, it can also be measured differently by the various stakeholders linked to the

organization. Therefore, the creation of value for each of these parties creates, in turn, several forms of value beyond the simple shareholder or accounting value of the company. This can be seen as another indication of the fragmentation of this concept (Derrouiche & al., 2012; Roche, 2002).

In this logic, we find the typology of Hoarau & Teller (2001), which seems to be the most complete and which highlights a model that includes seven types of value creation (value for the supplier, societal value, customer value, market value, employee value, partner value, and shareholder value) around the central goal, which is the creation of firm value (Figure 4 below).

Figure 4 – The multiple aspects of value creation



Source : Derrouiche & al., 2012

Expanding on this, creating value should not be done in a single direction that aims to enrich shareholders at the expense of other stakeholders, including employees, creditors, and governments. Therefore, it is necessary to move from a shareholder-focused vision of value that monopolizes value to a partnership-focused vision that emphasizes the need for leaders to consider all stakeholders in their value creation strategy (Charreaux & Desbrières, 2001; Mercier & Gond, 2005).

Thus, the **book value** of a company is the result of summing the value of all of the company's assets, minus its liabilities, which is called net worth. This value allows acquirers and investors to know the value of a company once its assets are sold and all of its debts are paid. For publicly traded companies, book value refers to the intrinsic value of the company's shares. It is obtained by dividing the book value displayed in the company's balance sheet by the number of shares that form its capital.

The main objective of companies is to satisfy their customers through products and services that meet their requirements. **Customer value** is a newly addressed concept, especially in marketing, and it involves creating value for/through the customer in the context of business performance strategies (Bély, 2005; Woodruff, 1997). It is also defined as the value perceived

by customers of a good or service, and it is characterized by its relativity since it varies from one customer to another depending on the perceived quality of each customer. A customer only buys a product if its perceived value is greater than the price they must pay to obtain it. The strong point of this type of value is that creating value for the customer generates value for the company in a very remarkable way (Van Laethem, 2005).

Competitive value refers to the internal and external relationships that a company creates with its environment in order to gain a competitive advantage. The best solution for developing good competitive value is the value chain proposed by Porter (1985). The skills and expertise involved in monitoring each activity in the value chain (primary and support activities) are the optimal means to ensure the growth of competitive advantages or new development. This type of value has also been defined as the resulting value of the sum that the customer is willing to pay to obtain a product or service (Hoarau & Teller, 2001).

Social value, in the strict sense, is defined as the improvement of working conditions, employee satisfaction, and quality of life. This value can be extended to society in the form of societal value, which refers to the company's responsibility to its external environment in terms of social effects (such as environmental protection). Research and nations have placed a great deal of importance on this type of value, to the point that some refer to companies as "citizen enterprises". Social value is difficult to measure and quantify due to the inaccuracy of information and measures concerning employees.

According to Cappelletti & Khouatra (2004), the enhancement of management quality and business operations constitutes **organizational value**. This notion is widely acknowledged in the organizational context, where decision-making complexities and operational processes are typically employed to foster value creation (Hoarau & Teller, 2001). The establishment of value hinges upon organizational capabilities, which necessitate a proactive approach to management and organization (Van Loye, 1998).

Finally, we should not forget **intellectual and informational value**, which is neglected by several typologies of value and refers to the richness of a company's intellectual capital in terms of knowledge, expertise, know-how, and information; it has become a key element of competitiveness. The mass of data and information collected, as well as their proper use by managers, are the main drivers of decisions. According to Edvinsson & Malone (1997),

intellectual value is a key factor in evaluating the true value of a company. They propose a method for measuring and evaluating a company's intellectual capital by identifying and quantifying intangible assets such as knowledge, skills, intellectual property, and customer relationships. This approach enables a better understanding of the contribution of these assets to value creation and better directs the company's investments and strategies.

Finally, we should not forget **intellectual and informational value**, which is often overlooked by traditional approaches to assessing a company's value. This type of value refers to the richness of a company's intellectual capital in terms of knowledge, expertise, know-how, and information, and it has become a key element of competitiveness. According to Edvinsson & Malone (1997), intellectual value is a crucial factor in evaluating a company's true worth. They propose a method for measuring and evaluating a company's intellectual capital by identifying and quantifying intangible assets such as knowledge, skills, intellectual property, and customer relationships. By doing so, organizations can gain a better understanding of the contribution of these assets to value creation and better direct their investments and strategies. Moreover, assessing individual knowledge is also vital to ensure effective human capital planning and knowledge retention, as emphasized by Gmira and Khaouja (2021). This involves identifying the factors that contribute to knowledge accumulation and its impact on individual skills.

In summary, creating value is a major concern for companies and authors. However, its understanding is closely related to the representations we have of the company and its purpose. Dominant logics in finance and strategy influence companies' strategic choices to maximize their potential for value creation. Therefore, it is important to consider these different logics when developing strategies that are tailored to the needs of each company and the expectations of its stakeholders.

2. The evolution of the concept of value through the different industrial revolutions

Throughout history, various definitions have been given to the notion of value, and this polysemy was not without theoretical implications. The first definition was given by Aristotle, who made a differentiation between use value incorporated in the natural use of the thing itself and exchange value, which constitutes the value of acquisition of another good through sale or exchange. Later on, this distinction served as a reference for classical and neoclassical economists; some defended the objective approach to value while others opted for a subjective

approach. Moreover, the purpose of this article is not merely to synthesize the notion of value from the point of view of economic theorists, but to establish a link between the historical evolution of this notion and the industrial revolutions experienced by the world over the centuries. A chronological analysis will be made on four major periods, namely the first industrial revolution (1.0), the second (2.0), the third (3.0), and the fourth (4.0). Each of these four periods coincided with a wave of industrial and technological innovations that changed society and the economy in conjunction with theories of value creation and wealth. In other words, the industrial revolution is nothing but the association of invention with economic and social developments.

2.1. Industrial Revolution 1.0 - Classical Current - Labor Value

The first industrial revolution emerged at the end of the 18th century and was marked by the exploitation of coal and the invention of the steam engine. This invention replaced craftsmanship, marking the era of mechanization, also known as the era of industry 1.0. The advent of these inventions disrupted the economic context as well as the conceptualization of value. The paradigm of wealth creation founded by the physiocrats was amended by Smith (1776), transitioning from physiocratic thought to ponocratic thought. Physiocrats considered labor as an element that produces nothing in itself, and that production is limited to nature, while labor only increases and assists this natural process. Industry, on the other hand, is a source of consumption of raw materials and wages, creating "an opposition between the fertility of the land and the sterility of industry" (Baudeau, 1771). Classical economists, however, considered industry and labor as sources of economic value, where productive labor adds value to the object on which it is exerted (Smith), and where industry transforms raw materials through effort-consuming processes.

Furthermore, it was with his famous paradox between water and diamonds that Smith demonstrated the discordance between use value and exchange value. The use value of a diamond is almost absent, but its exchange value is very high, whereas there is nothing more useful than water, which has very high use value, but its exchange value is almost non-existent. The resolution of this dilemma was the notion of the necessary labor required for diamond extraction, requiring a lot of effort and work. In other words, the quantity of labor that can buy or command a good determines its value.

Ricardo (1817), in the same vein as his compatriot Adam Smith, developed the notion of "incorporated labor" instead of "commanded labor," but also developed the concept of labor value. The production of a good is the result of the combination of the work of employees (direct labor) and the work of machines and other installations (indirect labor). Labor value is the result of incorporated labor instead of commanded labor. In other words, the exchange value of a good is not the result of its utility, but rather the quantity of labor it contains.

Marx (1867) posits that the concept of value is narrower in scope than in Ricardo's (1817) perspective. Marx contends that value is not solely determined by the quantity of labor invested in production, but also by the time required for production tools to become available for the production process. Marx further explains that the duration of time wasted during labor does not dictate the value of a good as it may be attributed to employee incompetence or laziness.

Belonging to the same school of thought but with a different approach, Say (1821) considered that the value of a good is produced through three factors: land, capital, and labor. According to Say, utility is the reason for the existence of value, but the purpose of production is to increase the utility of goods and subsequently their values. This means that utility determines the value (along with scarcity) of goods, where a good with low value is considered by the consumer as having low utility, while a high utility attribute to a good gives it a high-value character.

In conclusion, most of the classical economists questioned the determination of exchange value by use value and indicated that the exchange prices of goods are explained in usual situations by the conditions of production.

2.2. Industrial Revolution 2.0 - Neoclassical Current - Utility value

At the beginning of the 20th century, the electrification of production activities and the discovery of oil were the driving factors of the second industrial revolution which, in turn, gave birth to the Industry 2.0. During this period, production saw exponential growth, especially with the advent of assembly line and mass production methods. Despite the technological and industrial inventions, this period was also marked by economic and social crises in several countries. This situation was the triggering point for the new value paradigm coming from the neoclassical school of thought. The use of mathematical tools was the main point of innovation of the neoclassical economists compared to the classical ones; they showed a real search for scientific rigor. While taking Say's theory, axiomatizing it and offering a clearer and more

rigorous form, their new approach broke with "labor value" by replacing it with "utility value"; value is no longer determined by the labor required for production, but by "marginal utility." It was in the 1870s that Walras (1874) of the French school, Jevons (1871) of the English school, and Menger (1871) of the Austrian school affirmed that exchange value is directly correlated with use value. "Labor, once expended, has no influence on the future value of an object: it has disappeared and is lost forever," said Jevons. In other words, the value of a good is formed from its marginal utility and not its total utility; that is, the utility that the consumer attributes to an additional unit of the good or to the last unit consumed.

With the neoclassical economists, the paradox of water and diamond was lifted; value is a function not only of scarcity but also of subjective and distinctive utility that each individual attributes to the acquired good and not to the production of the good itself. Furthermore, the rationality of individuals is one of the best-known premises of the neoclassical school: maximizing the utility of the good or maximizing profit. In other words, choosing between creating value for the consumer or for the company; the producer cannot guarantee both.

All in all, we must conclude with the vision of the English economist Marshall (1890), considered the founding father of neoclassical economics. Marshall explained the absence of contradiction between the classical objective value theory and the neoclassical subjective value theory. Moreover, in the short term, it is marginal utility that determines the value of the good, while in the long term, it is the hours required for its production (or production costs) that determine its value (price). Thus, the marginalists are right in the short term while the theory of the classical economists is valid in the long term. Therefore, companies must sell at a price that can simultaneously cover production costs and employee wages, taking into consideration the labor value incorporated for the manufacture of goods.

2.3. Industrial Revolution 3.0 - Shareable value.

It took until the arrival of the second half of the 20th century to discover nuclear electricity, which motivated research in revolutionary materials and the dissemination of new transmission methods. This revolution, characterized by the 3.0 industry, also known as the digital revolution, has focused on the development of electronics, the emergence of telecommunications, and computing (discovery of the transistor and microprocessor). Communication has further improved through the rise of the internet, email, and even cyber-

connected systems. Additionally, workers are much relieved of the most complex tasks, making production more flexible.

In 2011, the economist Jeremy Rifkin introduced the principle of the third industrial revolution, which posits that new information and communication technologies will provide an optimal solution for overcoming economic and energy crises by reducing reliance on fossil fuels like coal and oil, and promoting the use of clean energy sources such as solar, wind, and water power. Rifkin (2014) criticized the creation of the self-regulated market myth by Adam Smith and his compatriots in chapter 7 titled "Retiring Adam Smith" of his book "The Third Industrial Revolution". Smith's application of Newtonian physics to the economy is seen as problematic, as excessive economic activity can lead to depletion of natural resources, environmental degradation, and threaten future generations. Rifkin proposed a new paradigm of "collaborativism" that rejects centralized public and private systems, and emphasizes shareable value over exchange value. The costs of transactions have significantly decreased thanks to the synergy between the fields of communication and energy. According to Rifkin (2014), the intelligent infrastructure will continuously provide data to all companies connected to the network, which can process it using advanced analytics to create predictive algorithms and automated systems, in order to improve their energy efficiency, significantly increase their productivity, and reduce their marginal costs throughout the value chain, almost to zero level.

Arnaud (2012) contended that Rifkin's recent publication may not bring forth any novel concepts compared to his previous works, but its primary merit lies in its lucid and stimulating exposition of the obstacles and possible remedies we encounter in the beginning of the 21st century.

2.4. Industrial Revolution 4.0 - Shared Value Ecosystem

We are currently in the heart of the fourth industrial revolution, which relies on the German-originated Industry 4.0 launched in 2013 by Angela Merkel (Haehnsen & Bernard, 2018). This industry utilizes artificial intelligence to control machines in real time and modify the internal and external environment of organizations, managing the physical world through a virtual universe. On the other hand, industrial internet enables continuous operation of factories through complete robotization; connectivity between systems is now ten times more efficient than before.

While partial automation characterized Industry 3.0, with no communication between the automated machines, Industry 4.0 enables machines to communicate with each other through vertical integration of process automation.

One of the objectives of Industry 4.0 is to respond to the ever-evolving demands of customers. Indeed, companies are facing customers who demand personalized and differentiated products. Rather than mass production, the focus is on producing unique, special, and personalized products while keeping costs equivalent (already, highly automated American and European factories have been able to compete with low-cost Asian factories); this new generation of intelligent factories gives customers the privilege of observing the manufacturing and delivery of their products in a record time.

In the era of Industry 4.0, companies are forming collaborative ecosystems to create value. According to Faure (2013), tomorrow's companies will be versatile, surpassing traditional boundaries between services and industries, material and immaterial added value, and technological and non-technological enterprises. These ecosystems will bring together multiple companies, institutional and social actors, clients, employees, and citizens to design, produce, and distribute products and services, and even energy. New technologies will be used as levers for value creation, and hyperconnectivity to external data will drive innovation in collaboration with ecosystem stakeholders for co-creation of value. Finally, organizational structures will become less hierarchical and centralized under the influence of multiple "connected intelligences" and the demands for cooperation of new generations.

In this new context, technology becomes the driver of product quality management and production costs. Companies must adapt to this new environment by making administrative and regulatory changes, developing a scientific and technical culture, and investing more in software innovation.

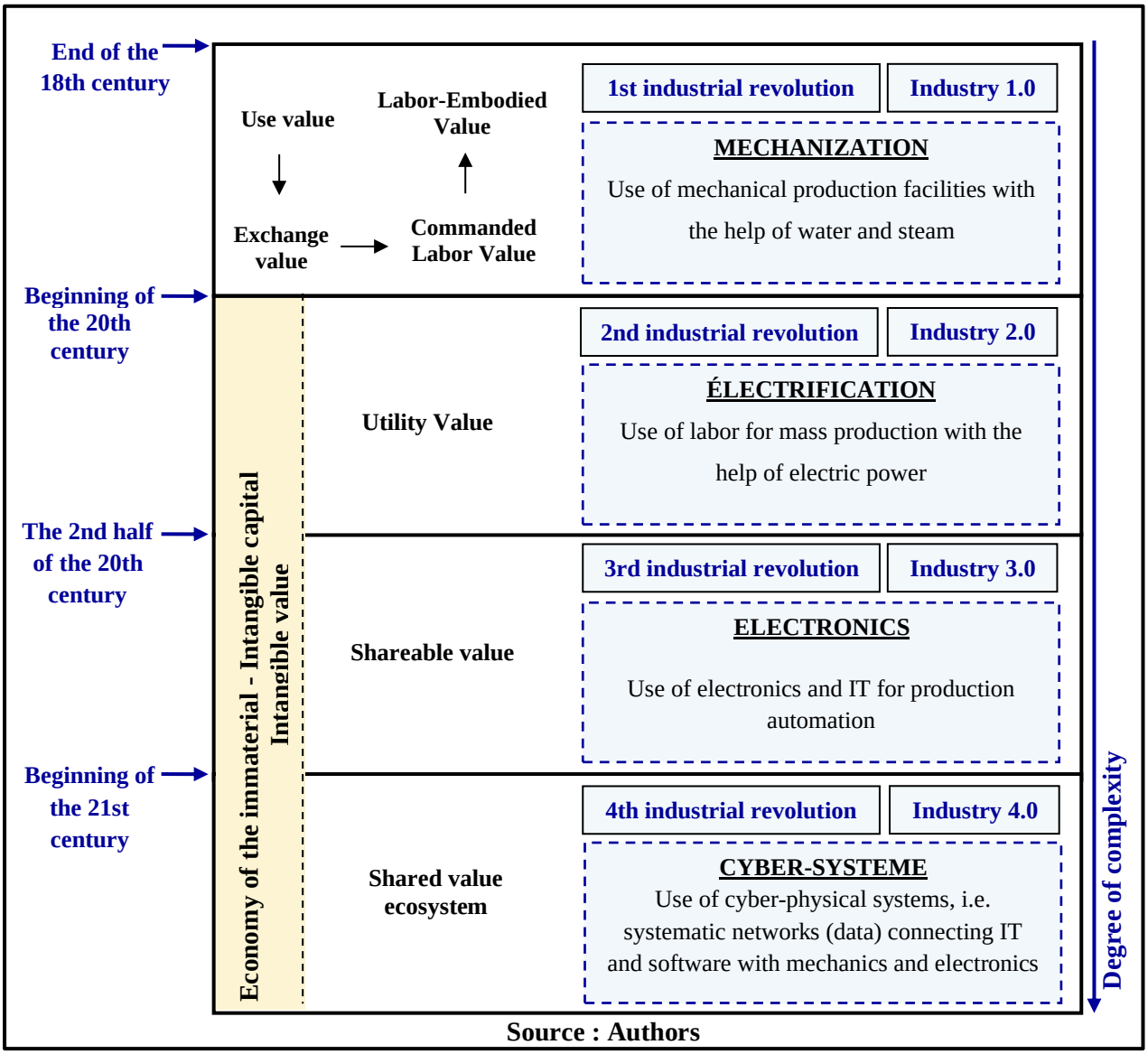
Synthesis

The concept of value has been central to economic thinking for centuries, but the changing socio-economic landscape of modern societies will alter how this concept is perceived. Value has shifted from being solely based on the work incorporated in goods or their utility, to being a shareable value created by various stakeholders within an ecosystem to satisfy and retain the end customer who, in turn, generates value in return. While value remains an important

economic concept, it now possesses unique characteristics. Ultimately, economic growth has historically resulted from innovation and the discovery of new technologies and sources of knowledge since the first industrial revolution, and this has had a significant impact on the development of the notion of value (see Figure 5 above).

Over time and through technological and economic advancements, the concept of value has taken on various forms. Initially, it was simply related to the products and services created. Nowadays, with the advent of the third and fourth industrial revolutions, creating value and gaining competitive advantage for companies mainly depend on intangible assets such as research and development, software and IT investments, advertising, communication, education and continuous training, and marketing expenses. According to Bounfour (2000), the proportion of intangible assets in a company's assets now exceeds that of tangible assets

Figure 5 - Evolution of the notion of value through the different industrial revolutions



Source : Authors

The concept of creating value has been extensively studied by various experts, resulting in a variety of definitions and theories. Its meaning varies depending on the context of its application, and the evolution of industries has always influenced this notion. During the first industrial revolution, value creation was mainly understood as favoring shareholders. However, with the emergence of the current era of Industry 4.0, the focus has shifted to creating value for all stakeholders. This shift aligns with current societal and economic priorities, indicating the importance of equitable and sustainable value creation.

Creating value involves an individual or organization's ability to produce something that fulfills a need, whether tangible or intangible, for an individual or group, regardless of the field or era. Nonetheless, to generate sustainable and satisfying value for all parties involved, it is crucial to consider the needs of all stakeholders. This approach ensures that value creation is not only beneficial but also equitable and sustainable, promoting its long-term success and contribution to society.

In light of our research, several managerial and scientific implications can be drawn. From a managerial standpoint, companies must focus on creating value for all stakeholders, including the environment, rather than simply maximizing shareholder profits. This major shift from previous industrial revolutions would allow for a more sustainable and equitable value creation process, ensuring long-term success in the context of climate change and sustainable development. Therefore, it is crucial to recognize the importance of value creation within a value ecosystem that takes into account all stakeholders, including intangible assets. The latter, which includes assets such as research and development, software and information technology investments, advertising, communication, education and continuous training, as well as marketing expenses, plays a crucial role in sustainable value creation and must therefore be taken into account to ensure long-term business success.

From a scientific perspective, our research highlights the complexity and multidimensionality of value creation, emphasizing the need for researchers and practitioners to avoid oversimplifying this concept and to take into account its different dimensions. To facilitate a better understanding of this concept, it is necessary to have a synthetic discourse and a unified theoretical articulation between the different management disciplines. The classification of schools of thought on value creation into four periods emphasizes the importance of historical contextualization and dynamic adaptation to economic, social, and technological changes.

Finally, our study demonstrates how schools of thought have evolved and influenced the way companies offer valuable products and services to their customers, which has significant practical implications for professionals who must develop value creation strategies that are adapted to current economic and technological contexts.

However, although our literature review has provided a useful overview of the evolution of the concept of value creation through the industrial revolutions, it focuses on a specific set of theories and concepts. Other factors contributing to sustainable value creation have not been taken into account, justifying the need for further research to explore these aspects and their impact on value creation. We strongly recommend the use of a systematic literature review and metadata to optimize future research. This type of review uses rigorous methodology to identify, select, and critically evaluate all relevant studies in this particular field, which would produce a more robust synthesis of available data. Metadata also promotes more transparent and reproducible research. Ultimately, the use of these methods can help researchers better understand the evolution of the concept of value creation through the industrial revolutions, while minimizing bias and maximizing the usefulness of their work.

In conclusion, the concept of creating value is intricate and has undergone significant changes over time. Nevertheless, its essence remains consistent in that it involves fulfilling needs to generate sustainable and satisfying value. To this end, it is essential to consider the needs of all stakeholders when creating value to ensure its long-term success and contribution to society. Moreover, it is important to note that creating value has not been without negative consequences since the industrial revolution. Each era has brought its own economic and social problems, ranging from difficult working conditions for workers to worker exploitation, wealth concentration, and environmental pollution. Therefore, it is crucial to take these side effects into account when evaluating the potential benefits of value creation in the current and future economic context.

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