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► **To cite this version:**

Romain Ben Taleb, Matthieu Lauras, Mathieu Dahan, Aurelie Montarnal, Romain Miclo. An Asset-Based Causal Loop Model to Improve Corporate Value. ICDSST 2023 - 9th International Conference on Decision Support System Technology, May 2023, Albi, France. pp.31-44, 10.1007/978-3-031-32534-2_3. hal-04102567

HAL Id: hal-04102567

<https://imt-mines-albi.hal.science/hal-04102567>

Submitted on 6 Sep 2023

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An Asset-Based Causal Loop Model to Improve Corporate Value

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Abstract. Assessing a company's value is an important leverage for decision-making. Indeed, all decisions made within a company are generally aimed at maximizing the company's value. In accounting, almost all models for assessing the value of a company are related to the amount of cash the company is able to generate. As a result, maximizing the value of a firm is usually about maximizing cash flow. However, beyond the usual accounting models, several recent initiatives have highlighted the key role of managing all assets, and not only the ones considered by the general accountability, in decision making and cash generation. Unfortunately, these methods are currently limited to conceptual and qualitative proposals that do not lead to a real decision support system thus far. This paper proposes a first step of formalization aiming at providing tools for these asset-oriented decision support approaches. The contribution is a Causal Loop Diagram to Support Decision-Making in order to maximize the value of companies. Based on a dedicated literature review, we design an asset-based causal loop model that formalizes the qualitative results of the literature review. We then develop an instantiation on an illustrative case via simulation in order to verify the relevance of the proposal and to show how such a model can be used in practice for decision making. This will support next research to develop an asset-based decision support system to maximize value of companies.

Keywords. Assets, Causal-Loop Model, Decision Support, Corporate Value.

1. Introduction

To be competitive and sustainable, any company has to maximize its value. However, the corporate value is something difficult to get and various formula can be used. The current methods for valuation rely on financial statements, particularly based on a cashflow perspective, which are produced after financial operations have taken place and have been recorded and presented according to reporting standards. This process is time-intensive and resource-intensive, and often only provides a retrospective view of the company's performance. In addition, only few assets of the company are considered in those models as demonstrated in [15] and [18].

Few authors like [3] have demonstrated the importance of including all of the company's assets in the decision-making process to improve the company's performance. According to accounting standards, assets are the resources controlled by a company and that can generate income [26]. Most of the assets are allowed to be accounted in balance sheet that is one of mandatory annual financial statements. Nevertheless, accounting provides guidelines to specific assets, notably immaterial assets such as Brand that valuation is difficult to assess and gives rules that exclude a large scope of resources from the recognition as assets [26]. However, only qualitative and conceptual approaches seem to have been proposed for the moment in the perspective of asset-based company modelling [3]. At the same time, [14] analyzed the use of simulation techniques for solving accounting and financial questions over the last 50 years. They showed that existing models never considered the company in a systemic way and that only some of accounting assets are usually examined. Obviously, system models have been used to evaluate different dimensions of a company's operational performance [18] but never to evaluate or predict its financial performance [14], and therefore its value. Authors such as [15] proposed models that include external and internal influences on the firms performance, but not with an asset-oriented perspective. On their side, [18] modeled with a resource perspective the case of a single manufacturing production unit. While it is asset-oriented, this model is far from considering all the assets of a company. Consequently, we believe that there is room for improvement by seeking to list exhaustively all the accounting and non-accounting assets of a company and by seeking to link them in terms of cause-and-effect relationships with respect to their impact on cash flow. The current research work aims to identify and formalize the causal links that exist between the different assets of a company in order to maximize its overall value. The ultimate ambition of this research work is to allow practitioners to instrument ex-post and ex-ante valuation models of the simulation or optimization type.

Finally, the expected benefits of this proposal are both to provide a prediction on the company's ability to generate cash flow and to be able to predict the state of the company's assets over time. This method will provide all the information needed to calculate the valuation of companies with performance forecasts that are undoubtedly more reliable, precise and above all dynamic than existing methods. Ultimately, this is the first step in a process aimed at establishing an asset-oriented decision support system to maximize the value of a company.

The remainder of the paper breaks down as follows. First, we will present the research methodology adopted. Then, the proposed model will be developed based on a selection of studied state-of-the-art and an application case will be described in order to underline the scope of the proposal and to discuss its limits. Finally, a quick conclusion and several research perspectives will be developed.

2. Research Methodology

The first step of our research methodology intends to answer the next questions:

1. Which types of assets are identified in the literature?
2. How are these assets connected in companies to complete value creation?

To answer the first question, we first referred to the existing assets in accounting standards [26]. Then we searched on the Scopus database for articles containing the keywords “asset” OR “resource-based theory” to explore the literature. The first step of the process is to distinguish and exclude articles that only deals with financial assets namely company’s shares, options, obligations and all the scope of financial assets that value is based on the performance of an underlying company. The goal of this research is to find in the literature the occurrences of the term “asset” that enlarges the accounting concept meaning that it is a resource used by a company to create value. We then identified the list of assets of any company, through a categorization process, to group the different resources into specific categories. To complete this process and strengthen the literature review, we then processed several queries with the following structure “{asset type} is an asset” to confirm that the literature contains this statement (Table 1). Thus, we tested these assumptions each time a category of asset was identified by the previous qualitative analysis. Results of the tests confirmed each category of assets.

#	Request in Abstract, Title and Key Words	Articles	Results
1	"customer portfolio" AND asset	20	7
2	"human resources as an asset"	4	4
3	"information technology" PRE/2 asset)	100	10+
4	"innovation" PRE/1 asset	93	5+
5	"material asset"	265	10+
6	"organization as an asset"	3	1
7	"product portfolio" PRE/2 asset	2	1
8	"reputation is an asset"	4	4
9	"stock is an asset"	2	2
10	"supply network" PRE/2 asset	8	6
11	"cash flow cycle" AND asset	2	1

Table 1. Methodology for assets’ identification

Table 1 provides the precise requests done in Scopus, the number of articles returned by Scopus, and the results columns that counts (at least if there is a +) how many of these responses correspond to the definition of asset that we aim at understanding.

In our research the term asset as “a resource that can generate income” is not necessarily “controlled” as required by the accounting standards. Human resources are not assets for IFRS because the contracts that bind them to the company are not (and are not willing to be) ownership contracts. Moreover, the criterion of recognition of an asset “that generates income” is admitted in accounting only when the cash flow of is processed. The findings highlight that resources in a system can participate to generate income or cash flow indirectly by impacting other assets.

Regarding the second question, reading the articles selected for question #1 allowed us to find some relationships between certain types of assets. We also queried Scopus by the specific term “impact” between two types of assets. For example, we searched for “impact of reputation on customers.”

For analyzing the results of these queries, we used two types of inferences to conclude to a result. On one hand, some articles directly provided a result to the research question, as for example in: *“In fact, most corporate annual reports boldly state that the firm’s people are its most important asset.”*[1]. On the other hand, results were deduced by inference from the original text, as for example in: *“Therefore, the certification can become a resource that interacts with the capabilities of the firm, expressing complementarities that stimulate the formation of dynamic capabilities”* [24]. In this example the original text did not use the term “asset,” but we could deduce that “certification” in this context is an organizational resource.

The second step of the research methodology consisted in modeling the literature analysis findings as a causal loop model or causal loop diagram [8]. A causal loop model is a causal diagram that helps visualize how different variables in a system are related to each other. This type of model fits with the qualitative findings from the literature review that assets of the company impact each other. Causal feedback loops are very important features of this type of model and this step intended to identify them for our problem. A link marked “+” indicates a positive relationship where an increase in the causal variable leads, all else equal, to an increase in the effect variable. A marked link “-” indicates a negative relationship where an increase in the causal variable results leads, all else equal, to a decrease in the effect variable. A positive causal link can be said to result in a change in the same direction, and an opposite link can be said to result in a change in the opposite direction, i.e., if the starting variable of the link increases, the other variable decreases and vice versa [8].

The third and final step was a verification of our proposed model. Practically, following the suggested causal-loop diagram, we modeled a fictive company and its basic management rules. Then, we instantiated this use case through a Systems Dynamics simulation approach. The results were discussed to highlight benefits and limits.

3. Proposal

This section develops the asset-based causal loop model we designed to improve the value of a company. It is divided into 3 sub-sections: (i) accounting and non-accounting assets’ identification, (ii) causal relationships’ identification and (iii) asset-based causal loop modeling.

3.1 Assets' Identification

Based on the definition that an asset is a resource used by the companies to create value, we categorized them and the following categories.

Clients: [22] or [15] consider clients as an asset for any company. They consider customer relationships as a resource that explains the business performance of the company. [15] identifies "customer relationships or brand equity" as a critical factor in the market value of firms. [22] highlights that investments for customer satisfaction and customer loyalty support firm performance.

Human Resources: Human resources are directly identified as a company asset in [2] and [4]. [4] explains that knowledge derived from "the collective intelligence and skills of employees" is a key resource for companies. Furthermore, [2] explains that "reports state boldly that the company's people are its most important asset".

Information technology: IT is clearly stated as a core corporate asset by [10] and that IT assets support other business assets.

Innovation: Innovation is an asset that merges different forms of investments in new processes, new resources or new products. It can take various forms such as prototypes or patents. [13] also considers the innovation capability of a company's resources as the key explanation of innovation in pharmaceutical companies.

Material resources: These are all the materials needed for production, from short-term consumables to long-term equipment such as machinery, land, vehicles as we extract from [25]. For example, [20] consider manufacturing units as assets for firms.

Organization: ISO 9001 or 14000 certifications are management methods that provide an advantage to the company and its Organization [5]. Thus [12] and [5] discuss management certifications as company's assets. We infer from several definitions that management methods are an index to identify the organization as a specific asset. [25] defines sales and operations planning methods as a process that provides strategic capabilities to decision makers. Management certifications become a resource for the company's ability to create value.

Products: [11] considers the requirement of specific investments in assets to create products. This allows products and the products portfolio to be considered as an asset. [7] proposes the application of portfolio management to electrical installations in the energy sector. Thus, we conclude that the products that the firm owns or can produce (portfolio) can be considered as assets for the firm.

Reputation: [6] identifies brand as a market-based asset. [9] explains that reputation has an impact on the price of products. [19] informs about the impact of employer brand on employee loyalty. By deduction, the reputation of the company can be identified as an asset that impacts other assets and the value of the company.

Stocks: Stocks identification refers to the definition of inventories in international accounting standards and more precisely IAS 2 [26].

Supply network: [17] confirms the supply network as an asset for a company and emphasizes the importance of accounting for supply relationships as intangible assets.. The supply chain asset is also influenced by environmentally friendly certifications that reduce risk and manage behavioral uncertainty among supply chain members [28].

Cash Flow: Cash flow (CF) is the last type of asset encountered in the literature. Definitions of cash flow can be found both in the academic literature and in international accounting standards. IAS 7 [26], which standardizes the "Statement of Cash Flows", gives the definition of cash flow as followed: "cash flow is the sum of all sales less all costs of other assets". According to [23], cash flow influences and is influenced by all other assets. The most important positive cash flow is the sum of sales to clients, but assets that belong to the company can be sold, if they are owned by the company, such as material resources (e.g., a machine). Moreover, most of documented methods to compute a company's valuation are based on past and forecasts of Cash Flow.

Thus, we have identified eleven types of assets existing in all companies, namely: Clients, Human Resources, Information Technology, Innovation, Physical Resources, Organization, Products, Stocks, Supply Network, and Cash Flow. These are assets in a broader definition of the concept than that found in accounting standards. It is by acting on all these assets that companies manage to influence their performance, and their value. The challenge now is to understand the causal links that exist between these assets, particularly with respect to cash flow, the source of the company's value.

3.2 Causal Relationships' Identification

To identify the relationships between the assets, we used the keyword "impact" in the requests. This term is commonly used to indicate that a variable has an effect on another one. With requests formatted as [{"type of asset}" and "impact*" and "{other type of asset}"] we identified at least the following relationships between the assets in the literature even if not exhaustive.

Clients (from and to): Reputation and Innovation have a direct impact on customers, as explained in [8]. For example, [8] indicates that reputation has a positive impact on product price. Moreover [8] demonstrates the positive impact of brand and customer relationships on the market value of the firm. Customers, through sales, have a direct impact on cash flow as explained in IFRS 15 [26].

Human Resources (from and to): Human Resources are needed to produce products [25], and can increase innovation or reputation [13].

Information Technology (from and to): [16] summarizes the role of IT tools as it distinguishes four functions in companies: (a) "Technology as Labor Substitution Tool," (b) "Technology as Productivity Tool," (c) "Technology as Information Processing Tool," (d) "Technology as Social Relations Tool." Based on [16] IT can have a positive impact on Material Resources and Human Resources as a Productivity Tool or negative impact as a Labor Substitution Tool. It can also influence Organization by improving management capabilities as stated in [10].

Innovation (from and to): According to [13], Human Resources can have a positive impact on Innovation. Moreover, [21] identifies other sources of Innovations: from materials, products, marketing, processes, or organization. Thus, Innovation can increase or decrease in regards of other assets such as IT or Organization [9], [10].

Material Resources and (from and to): [25] Material Resources and Stocks can be purchased from Suppliers Network or produced in the company. They can be produced by the Human Resources who manufacture the company's Products using other

Material Resources. Material Resources increase when they are acquired or produced and decrease when they are used (amortization and depreciation [26]) or sold

Stocks (from and to): Material Resources and Products in storage, before they are used or sold, are considered as a Stock asset [26], [25]. The quantities in Stock evolve in the same way as Material Resources and can be sold to Clients.

Organization (from and to): Organization can improve the Supply Network by reducing risks and uncertainty [24]. It can improve company's ability in Innovation [21] and customers management [22]. Organization can also be improved by Information Technology such as Business Intelligence or ERP systems [10].

Products (from and to): can be managed as a portfolio that is acquired directly from the Supply Network or is the positive result of Innovation [21]. They are produced by employing Material and Human Resources in order to be sold to Clients [23], [26]. Basically, sales operations increase the Cash Flow [23].

Reputation (from and to): [9] explains that reputation impacts the price of the products. [9] highlights the sensitivity reduction of customer price connected to products' reputation. [19] informs about the positive impact of employer brand on employees' loyalty. Reputation is increased by work of Human Resources and by Innovation.

Supply Network (from and to): The Supply Network can be positively impacted by the Organization of the company. It provides Material Resources (increase) at a cost paid with Cash Flow (decrease) [25].

Cash Flow (from and to): Cash Flow (CF) is the sum of all the sales minus all the cost of the other assets. All the other assets can impact Cash Flow. Getting new assets is considered as investment that are different from fixed costs due to the assets' ownership or use. The most important positive flow of Cash Flow is the sum of the sales to Clients, but some assets that are owned by the company can be sold, such as Material Resources (a machine for example) or Stocks [23].

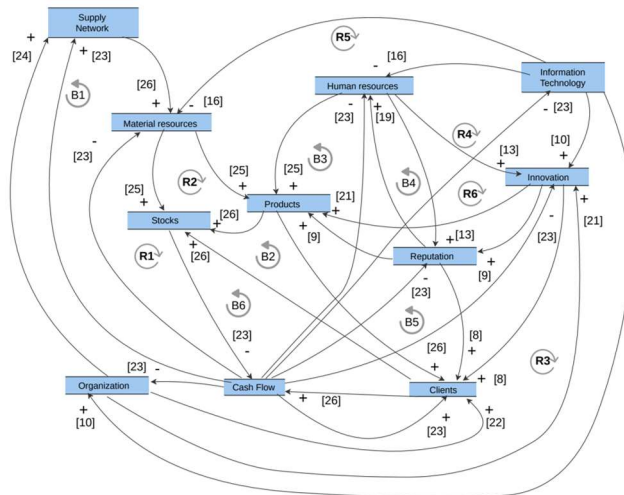


Fig. 1. Complete causal loop model

At this step of the research, we have only identified these relations between the assets by a qualitative methodology and qualitative links. Next step of our article is to highlight how these connections can be formally analyzed thanks to a causal loop diagram methodology and later, to highlight how this analysis can support companies modelling and value-oriented decision-making.

3.3 Asset-Based Causal Loop Model

Type of Loop	Description	Assets involved
R1 – Reinforcement	Diminishing CF to increase Material Resources diminishes CF, increasing Stocks and diminishing CF	Material Resources (+) Stocks (-) CF (-)
R2 – Reinforcement	Diminishing CF to increase Organization increases Supply Network that increases Material Resources that increase Stocks that reduce CF	Organization (+) Supply Network (+) Material Resources (+) Stocks (-) CF (-)
R3 – Reinforcement	Diminishing CF to increase Organization increases Innovation that increases Products that increase Stocks that reduces CF	Organization (+) Innovation (+) Product (+) Stocks (-) CF (-)
R4 – Reinforcement	Diminishing CF to increase Information Technology reduces Human Resources that increase Products that increase Clients that increase CF	Information Technology (-) Human Resources (+) Product (+) Clients (+) CF (-)
R5 – Reinforcement	Diminishing CF to increase Information Technology reduces Material Resources that increase Products that increase Clients that increase CF	Information Technology (-) Material Resources (+) Product (+) Clients (+) CF (-)
R6 – Reinforcement	Innovation increases Reputation that increases Human Resources that increase Innovation	Innovation (+) Reputation (+) Human Resources (+)
B1 – Balance	Diminishing CF to increase Supply Network increases Material Resources that increase Stocks that diminish CF	Supply Network (+) Material Resources (+) Stocks (+) CF (-)
B2 – Balance	Diminishing CF to increase Material Resources increases Products that increase Clients that increase CF	Material Resources (+) Products (+) Clients (+) CF (-)
B3 – Balance	Diminishing CF to increase Human Resources increases Products that increase Clients that increase CF	Human Resources (+) Products (+) Clients (+) CF (-)
B4 – Balance	Diminishing CF to increase Human Resources increases Reputation that increases Clients that increase CF	Human Resources (+) Reputation (+) Clients (+) CF (-)
B5 – Balance	Diminishing CF to increase Human Resources increases Innovation that increases Clients that increase CF	Human Resources (+) Innovation (+) Clients (+) CF (-)
B6 – Balance	Diminishing CF to increase Material Resources increases Products that increase Clients that increase CF	Material Resources (+) Products (+) Clients (+) CF (-)

Table 2. Main causal loops identified regarding the cash flow perspective.

The view of the complete Causal Loop Diagram (Figure 1) emphasizes the difference between Causal Loop links that are financial, material, informational or work flows. This next model is a Causal Loop Diagram that highlights the dynamics inside the companies with an asset perspective. This Causal Loop Diagram will be able to support simulation modeling to estimate companies' performance and value. Twelve loops directly influencing the cash flow, and so the value of the company, have been identified in Table 2. 6 Loops correspond to the definition of reinforcement loops and 6 Loops correspond to balancing Loops. The reading of these loops gives an overview of the decisions that can be taken on the company's assets and that have an impact on its performance via its Cash Flow and therefore its valuation.

4. Illustrative Example

4.1 Description of the Fictive Company

An entrepreneur wants to start a company that would create and distribute boardgames to customers. The entrepreneur wants to set up a simulation to estimate the future financial performance of his company. To do so, he defined a set of assumptions and rules for the assets to simulate decisions. The company starts with a single human resource who is the creator of the company. When the cash flow is positive, he recruits other employees for 10% of this amount. These employees remaining in the company their cost persists even when the treasury is negative. All human resources devote a part of their working time to the creation of new games (Innovation) and to commercial promotion activities (Reputation). The more employees there are, the more cash the company can generate but also the more it spends (loops). Other constraints, such as the maximum cost invested in game events or a constraint on the rate of recruitment in the game, which cannot exceed 0.5 employee/month, impose constraints on the system.

4.2 The Simulation Model

The proposed Causal Loop Diagram has been instantiated via a System Dynamics type of simulation model in Anylogic software. Following the System Dynamics oriented simulation standards, custom equations have been defined for all concerned stocks to model assets, flows to model relationships and variables to set values (see Table 3). They have been used to compute the simulation results and translate the Causal Loop model representations. The equations account for the impact of assets on other assets and define the rules and constraints that link them. One rule is to hire new employees when cash flow is positive at 10% of free cash flow. One constraint is that the company will not spend more than 100,000 units of money per period to promote games through the events network or hires at maximum 0.5 employee/month.

The time step chosen for the simulation is one month. The simulation was run over forty steps (months) to analyze the performance of the company.

4.3 Results

The cash flow units generated in the simulation, which are needed for processing the evaluation of the company in further research, are presented in Figure 2. In this paper, we mainly focused on the B1, B3 and B5 loops identified in Table 2 as they are the more basic ones. Basically, we simply consider that Human Resources are employed to create new games (Products) and promote them (Reputation). These new games allow increasing the demand of the Clients which increase the turnover of the company, and so the Cash Flow. But, at a same time, Human Resources, Material Resources and Supply Networks have costs that reduce Cash Flow. We can notice that B3 and B5 have a net positive impact on the Cash Flow of this company as it overtakes the effect of the constraints. The first plateau where the cash flow is negative is explained by the initial decrease in cash flow related to human resources costs. However, because the initial

Type	Name	Description	Rule	Equation
Flow	buysEv	counts games sold in Events	represents 5% of Clients. Max = 200	$\min(0.05 * \text{Clients}, 200)$
Flow	buysSpe	counts games sold in Shops	represents 90% of Clients	$0.9 * \text{Clients}$
Flow	craft	number of games crafted	crafts the demand + 5% of stock	$(\text{distribSpe} + \text{distribEv}) * 1.05$
Flow	create	account for creator's wages spent in R&D	100% of creator's wage is R&D	wageCreator
Flow	develop	account for employee's wages spent in R&D	20% of spendings in wages	$0.2 * \text{Employees} * \text{wageEmp}$
Flow	distribEv	counts products sold in Events	based on Client's demand	buysEv
Flow	distribSpe	counts products sold in Shops	based on Client's demand	buysSpe
Flow	enablestoCraft	not used. Boolean variable meaning at least one game is created	not used	0
Flow	pays	financial flow for supplier payment	supplier is payed based on a unit prod. cost	$\text{prodCost} * \text{craft}$
Flow	paysCr	wage of creator	fixed	$\text{Creator} * \text{wageCreator}$
Flow	paysEmp	wage of employees	when treasury is > 0, 10% of treasury is invested in additive workforce from new employees	$\max(0.10 * \text{Treasury}, 0)$
Flow	paysgame	turnover	Demand * Price	$\text{buysSpe} * \text{gameprice} + \text{buysEv} * \text{gameprice}$
Flow	produces	R&D to create games. Accounted in GamesPortfolio's formula	not used	0
Flow	promote	employees generate new clients	employees' work is to generate clients	$\text{Employees} * \text{cliperemp}$
Stock	Clients	number of clients. Initial Value = 100	depends on number of employees that promote games and on number of games in portfolio	$0 * (\text{paysgame} + \text{buysSpe} + \text{buysEv}) + \text{promote} * \min(\text{GamesPortfolio} * 2, 300 / (\text{GamesPortfolio} + 1))$
Stock	Creator	number of creator. Initial Value = 1	one single entrepreneur has founded the company and works in it	$0 - (0 * \text{paysCr}) + (0 * \text{create})$
Stock	Employees	number of employees	depends on how much the company spends in wages - when possible 10% of treasury - but maximum hire is 0.5 new employees per month	$\min(\text{paysEmp} / 2000, 0.5) - 0 * (\text{develop} + \text{promote})$
Stock	EventsNetwork	number of events participated	depends on the ratio of Clients from events	$\text{buysEv} / \text{avgSales} - 0 * \text{distribEv}$
Stock	GamesPortfolio	number of games the company can make craft and sell	new games are not linearly produces. Assumption is new games are created fastly at beginning, less fast after, but controlled by the average cost of R&D for a game	$\text{Math.log}(1 + \text{ResearchDevelopment} / \text{avgCostRD}) + 0 * \text{produces} - 0 * \text{enablestoCraft}$
Stock	GamesCrafter	total of cost to pay to supplier for crafting	supplier is payed based on a unit prod. cost	$(\text{enablestoCraft} + \text{craft}) * 0 + \text{pays}$
Stock	GamesStock	number of games in safety stock	5% of the demand	$0.05 * (\text{distribSpe} + \text{distribEv}) - 0 * \text{craft}$
Stock	ResearchDevelopment	amount of the part of wages cumulated in R&D	Adds costs of R&D	$\text{develop} + \text{create} - 0 * \text{produces}$
Stock	SpecialShops	number of shops to sell to	number of retailers to sell to the average demand for a retailer	$\text{buysSpe} / \text{avgSales} - 0 * \text{distribSpe}$
Stock	Treasury	amount of Cash owned by the company. Initial Value = 10000	Result between turnover and all costs including retailers margin (8)	$-\text{paysEmp} - \text{paysCr} - \text{pays} - \text{costEv} + \text{paysgame} - \text{distribSpe} * 8$
Variable	avgCostRD	average cost of R&D required to finish one new game	fixed value representing the average cost of development for one new game	30000
Variable	avgSales	average number of product sold in a shop or an event	average number of product sold in a shop or an event	30
Variable	cliperemp	average number of new client generated by employees	average number of new client generated by employees	$\text{wageEmp} / 400$
Variable	costEv	cost of participating to events	cost of participating to events. Maximum 100.000	$\min(1500 * \text{EventsNetwork}, 100000)$
Variable	gameprice	average sale price of a game for final customer	average sale price of a game for final customer	40
Variable	prodCost	cost of production of one game	cost of production of one game	10
Variable	wageCreator	wage of the Creator	wage of the Creator	3000
Variable	wageEmp	wage of an employee	wage of an employee	2000

Table 3. Complete description of the illustrative example

cash flow was positive, the company hired the time equivalent of one employee. During this period, the cost of the employee is not sufficient to sell enough games to generate positive cash flow. However, there are enough human resources to create new games, which also increases demand. After the 12th month, the company's assets are sufficient to generate positive cash flow. The second downward slope in period 28-32 corresponds to the effect of a constraint on the acceptable costs to maintain the distribution network (Customers) that produces a decrease in cash flow. But loop B4 overcomes this constraint from period 33 onwards because the employees manage to sell enough games. We also remark that the cash flow trend for this company takes an exponential shape that is a limit of this example because we did not include life cycle constraints.

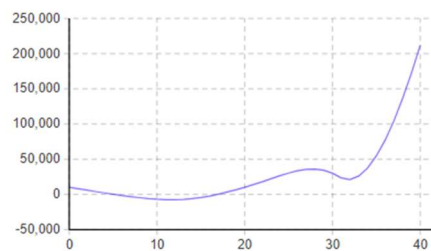


Fig. 2. Outputs of cash flow by simulation

5. Conclusion

The goal of any company is to maximize its value in order to be competitive and sustainable. The traditional methods of valuation, which are based on financial statements and a cashflow perspective, are time-intensive and limited in scope. They only consider a few assets of the company and provide a retrospective view of its performance. There was a room for improvement in terms of identifying and formalizing the causal links between different assets of a company and linking them to their impact on cash flow. The current research work aimed to do just that, with the ultimate goal of establishing a decision support system to maximize the value of a company. Our proposal was to model the causal relationships that exist between all the assets of a company and to identify the main associated causal loops able to influence the cash flow of this company. Finally, as demonstrated in the illustrative case, this contribution should make it possible in the near future to provide a more reliable, precise, and dynamic prediction of the company's ability to generate cash flow. The benefits of this proposal are significant, and it is the first step in a process aimed at maximizing the value of a company.

While this research work remains in its infancy, several research perspectives will have to be developed in the coming years. Notably, develop a metamodel that embeds this Asset-Based Causal Loop Diagram to provide a complete view of the companies as systems led by the strategy to create value. The next step in our work should be to validate the model with a real-world case based on historical business data. Then we will examine and apply accepted business valuation methods to these simulation results.

Finally, this causal diagram can solve decision support problems thanks to the levers of action it mobilizes (the assets) and the output of the system it dynamically predicts: the cash flow and the valuation of the firm. Mainly, this model can support the use of optimization methods to maximize the value of companies.

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