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# Making sense of project value from a value-co-creation perspective: an exploratory conceptual framework

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**Abstract**

This paper proposes a conceptual framework to make sense of how project value is created in projects. We study the extant project management value creation literature using a value co-creation lens based on service-dominant (S-D) logic. We explore how project value is proposed, exchanged and then realized following a project life-cycle. This leads to the identification of an exploratory "value co-creation life-cycle" framework. This framework shows value as a whole transcends the limitation of measurable products value normally used to define the project value. In particular, it shows how operant resources (or actors) - typically referred to as stakeholders - within the project management system exchange services and integrate resources in order to co-create value. The exploratory framework, in turn, would enable future investigation of real projects with the view to unpacking the complex dynamic behavior of project value creation.


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Project Management; Project; Value co-creation; Value co-creation life cycle; Project value life cycle; Project ecosystem; Project stakeholders; Project actors;

## 1.1 Introduction

Projects must create value for organizations[1]. Many studies are presently being conducted with the aim of defining the elements of project value and the factors that affect its achievement. In doing so, the current research aims to expand the project assessment methods and fundamentals beyond the iron triangle, which presents a limited view of project based on time, cost and quality. There is a general consensus among researchers and practitioners that project assessment should always be based on project objectives. The classical approach views a project as a task-based, temporary organizational unit aiming to execute a defined work on behalf of its sponsors. On the other hand, according to the Rethink of Project Management (RPM) view a project is a temporary organization charged with creating value for its sponsor [2]. This perspective fundamentally changes a project's purpose, as it implies that its evaluation of success or failure should reflect the project's ability to create value as perceived by the stakeholders along the timeframe designated for completing the project lifecycle.

In an attempt to gain an insight into the value of the aforementioned approach, Chang, Chih, Chew, and Pisarski [3, 4] studied three large projects in the Australian Defense Organization, concluding that project stakeholders relied on value co-creation as the ultimate measure of project success or failure. The authors highlighted that, even though the projects examined in the study were perceived as successful, if they were assessed through the iron triangle methodology only, each would be deemed unsuccessful, as the focus would be solely on task completion.

Although value co-creation is a recent concept, it is increasingly being used in an effort to gain a better understanding of the relationships between suppliers and customers [5]. In S-D logic, projects are perceived as a series of A2A (actor-to-actor) exchanges that create value, thus enhancing the success or value proposition of the project to all stakeholders. This view necessitates evaluating all the service exchanges that the project is involved in to understand its value correctly. In service-dominant (S-D) logic value is co-created through interactions between actors, in which service is exchanged for service [5]. In project context, all stakeholders (or Actors) exchange services. In each exchange, value is co-created as a product of the knowledge which each actor brings to the exchange. This product of knowledge (i.e. knowledge integration) is the value that stems from each exchange. For example, a subject matter expert uses its knowledge to define the requirements of an end-user, and translates this to an algorithm that can be coded. A programmer will use this outcome to create a code that will satisfy end-user. This code will then be used by the end-user (i.e. cashier) in a service exchange with a customer (i.e. shopper). Before the point of exchange (full or partial project delivery) with customer, it is called value-in-exchange for the provider and after the customer was engaged in the exchange, it is then value-in-use or value-experienced by the beneficiary [6-9]. This value is solely determined by the beneficiary in the context of its usage


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of the service [6-10]. Value in-exchange is then the price paid for the code. A good example is the automated checkout system at a supermarket. If the shopper uses the self checkout function, then they have directly experienced benefits from the code created. However, if they choose to use a checkout teller, then the teller would have used the code and the shopper then experienced the benefit of the code indirectly. The price that the supermarket has paid for the code is then the value in-exchange. This is a departure from the traditional view of project value, and our ability to price it before it's experienced (or delivered). Under this scenario, we can only identify that there will be value-in-use in this exchange. We can, however, calculate the value-in-exchange which is the cost of developing the code. The full project value, or value co-created will continue to be experienced as long as there are shoppers using it, for a very longtime in the future.

As such we can say that project cost (price) is value-in-exchange, and project benefit is the value co-created. While it is possible to quantify the value in-exchange, value co-created becomes part of the ecosystem and will be experienced every time that resources or knowledge created by project is used in an exchange, resulting in an unbound value.

**1.2 Organizational project management (OPM)**

PMI defines OPM as "An organizational body or entity assigned various responsibilities related to the centralized and coordinated management of those projects under its domain[1]. The responsibilities of the OPM can range from providing project management support functions to actually being responsible for the direct management of a project" [11]. This definition pertains to the umbrella organizations within which projects are managed. Aubry and colleagues [12], noted that "organizational project management is a new sphere of management where dynamic structures in the firm are articulated as means to implement corporate objectives through projects in order to maximize value" [12]. This definition is consistent with Service-Dominant (S-D) logic, as it describes OPM as a set of structures (institutions), and processes "articulated means" that are used to "maximize value" through exchange that "implements corporate objectives through projects" [12]. Based on this view, the definition can be paraphrased to "OPM is the institutions and processes that are used in a firm to exchange value" which is remarkably consistent with the definition of an ecosystem in S-D logic [6]. Put simply, the OPM and its associated network of stakeholders can be broadly conceptualized as the project ecosystem.

**1.3 Critical review of the body of research on projects in S-D logic**

To date there is only one publication examining projects within S-D logic space [8]. There are five other publications which look at value co-creation and project management [4, 13-16], and one publication that looks at measuring value co-creation for a special case [16]. Project value co-creation has not been defined concisely, in any research so far. Furthermore, the attempts to capture or quantify value-co-creation were only partial. Lambert and Enz [16] looked for measurable indicators to confirm that there is value-co-created, however they identified difficulties in assessing other aspects that were observed. This is more akin with calculating observable and measurable financial benefits, as opposed to capturing the full value co-creation. Vargo and Cavlier [6], remained faithful to the abstract concepts and did not venture into trying to precisely define value co-creation.

In this paper we opted to use S-D logic as a lens to view projects value as it transcends project products and pre-set targets for the project to achieve. In S-D logic value co-creation is a term used to describe the full outcome of all exchanges, which includes all value that are experienced by all actors of the project and does not have any prejudice in favor of identifiable and quantifiable indicators[8].

Following is a discussion of the key ideas developed so far:

1. Projects are conceptualized as service ecosystems [8]. They argue the following points:
    a) Projects have all the characteristics of service ecosystems. For example they have the three institutional levels: macro, meso and micro [6-8]. Creation of a shared institutional logic is a critical element in defining ecosystem. In our case, projects exist within a program, and in-turn into a portfolio that governs the management of projects. Institutions are nested within an ecosystem, which is fully reflected in an OPM. The project is the micro institution, program is the meso institution, and the whole portfolio is the the macro level of the institution. In reality there is no limit to the nesting levels, and the whole ecosystem can be project based [8]. S-D logic also adopts the view that unless an ecosystem continually adapts and co-evolves with its environment, it will eventually reach a state of stasis and start a process of decay. Ecosystems continuously evolve or transition to another state as a result of the interaction among their actors (service exchange) with survival as their main objective. S-D logic recognizes that ecosystems do transition from one state to another; however, as this transition is temporal, it is not possible to determine the realized value by applying the value proposition only. We also argue that projects do not naturally exist, and are not the final state of a system. Projects commence with the objective of reaching a conclusion to deliver a strategy-aligned business outcome (or aim to co-create value, from the S-D logic perspective). Once the value has been co-created by a project, the project system is typically "destroyed" or "dismantled". This is a fundamental difference between

projects (short-lived) and ecosystems (on-going self-sustaining survival), which must be recognized when applying service ecosystems concept to projects [6]. Even though project resources may regroup partly or entirely into another project system to co-create (another) value again, this is irrelevant in the context of the original project, as its system has reached it natural end. Only value co-created (knowledge) has survived the project.

b) Projects are a value co-creation exercise or an exchange of resources (e.g. knowledge, skills and expertise) between many actors (stakeholders). Value is proposed, exchanged and subsequently mutually experienced as benefits (e.g. enhanced integrated knowledge from diverse disciplines in advancing the project towards achieving its strategic business objectives) by the collaborating actors Project management is then the process by which value co-creation is managed, or knowledge is generated.

c) Value co-created can also be experienced by other actors (who were not party to the initial exchange) by using resources that resulted from the initial exchange in the future. In other words, the co-created project value may result in new resources that will be used (hence contextually experienced) by customers/users of the project outcome (e.g. an ERP system or a bridge) who were not party to creating (staff hired after the ERP system was implemented), but subject to adjusting behaviors to adapt to using resources that resulted from the initial exchange.

However, some features that distinguish projects from ecosystems need further consideration. Such features are related to the nature of projects being:

a) The "temporary organizational construct" [11, 17] that is created with the intention of being terminated. While ecosystems are described as an enduring environment [6-8]. As such projects cannot be ecosystems like all others; at best they are special type of ecosystem that can be called "project ecosystem".

b) We view projects as a specific case of value co-creation or complex service exchange in which multiple operant resources interact to co-create value within a wider system (mostly organization) [8, 11, 17]. This view is supported by the work of [16] in which projects were used to co-create value in a B2B setting. However, we hold the view that projects support the concept of ecosystems as a construct in which value is exchanged [8]; that projects inherit the characteristics of ecosystems, and that projects may only be a special case or type of ecosystem during the lifetime of the project.

2. The remainder of the research focused on finding evidence that value co-creation can and is used to assess project success. In all cases there was sufficient evidence to support the proposition that value co-creation can be used to justify substantial or mega projects. The following are some of the ideas introduced:
   a. Goal setting will improve understanding, tracking and measuring of project value [18]. However by no means will the project capture and assess the holistic project value on its own [19]. This capture can only be done in an enduring organization – the OPM.
   b. Value co-creation was used to assess the success of projects despite the lack of such evidence using traditional performance measures [4].
   c. Value co-creation was used to identify potential projects, and establish projects or programs of work [16]. Financial measures were successfully used to evaluate initiatives (projects) in proposition, exchange and realization phases, however it was not possible to account for the all values co-created [16].
   d. Projects were used as constructs to exchange value [16] in a business-to-business exchange.

Based on this review, there is sufficient evidence to support the case for further research to better understanding of projects in S-D Logic.

**2.1 Conceptualization of project management as a value co-creation process**

Projects are used as a construct for value co-creation [16]. Projects and ecosystems have many similar characteristics [8]. In this research we prefer to look at projects as a type of a complex exchange within an ecosystem, constraining it to the level of a project ecosystem. Before discussing our view on project value, we will briefly visit value and projects, lifecycles in S-D logic to establish a common ground and better formulate our research questions.

The project lifecycle is best explained by using a hypothetical construction firm. In a given scenario, the organization (project team set up by the construction firm) is tasked with (contracted to) building a bridge, for example, and approaches this task as a project. Once the construction is completed and the bridge is delivered, the project terminates and the organization is dispensed. However, the team that built the bridge may be contracted again to build a tunnel, for example, and would commence a new project. In this case, the organization that delivered the bridge would need to be reconfigured substantially, as it needs earth boring resources to dig the tunnel, etc. Under this scenario, the organization has been reconfigured to match the intended or target output.

This example clearly demonstrates that value exchange does not necessarily take place in a direct interaction between project actors and the service beneficiary, as it may require intermediaries (a government agency such as a Road Transport Department). It is actually a process flow, in which value is proposed by either


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resource integrators or the beneficiary of the service, then exchanged and ultimately used. The project will be deemed complete once the bridge or the tunnel is completed and functional. At this point, it becomes a resource that enables the service exchange (i.e., transport service for people from point A to point B). The value co-creation required all stakeholders to exchange resources and knowledge to achieve it.

In the above example, the government is primary facilitators of the exchange. In other words, they are the agents nominated by the actors (stakeholders) to exchange services or co-create value. In this context, project management is the process that is used by the institutions involved to manage the delivery of the bridge (resource or knowledge). The complexity of the exchange that is demonstrated in the above scenario requires exchanges by various governmental bodies, contracting organization etc. For example, the contracting organization (which is typically project-based) enters into a contract with the government to manage and deliver projects. Within the same organization, several projects are being executed at the same time and are at various stages of completion. Each project will most likely involve several subcontractors, who in turn are also contracting organizations in their more specialized field, and so on. This raises the possibility of organization and process nesting. This nesting increases the complexity of the entire ecosystem, and is typically referred to as a program/portfolio of projects. In S-D logic, this correlates to the macro, meso, and micro process classification.

This nesting can actually extend beyond the three levels noted above, depending on the number of entities in the process chain. Regardless of the nesting level, the project will depends on the outcome of other projects to generate the resources required and so on. When considered in this manner, projects can be viewed as resources. These resources are integrated to build the bridge or the tunnel, which will ultimately be used in a value co-creation. As such, the bridge builders, along with bridge users, are value co-creating. The government and the contractor are institutions that facilitated the exchange or they are “agents” of stake-holders. The example given above is a very simplified view of a practical project, which typically involves multitude of other actors (stakeholders). Other stakeholders that are not as visible include Banks and financiers (including shareholders/investors) that are involved in financing and extending credit to facilitate this exchange. Insurance organizations that are involved to contain the risks, Regulators are also involved to ensure that the exchange is ethical etc. Many of these stakeholders also have their own respective ecosystems and associated institutions [5]. The diagram below was developed by Mallak to identify all such stakeholders or actors [20, 21].

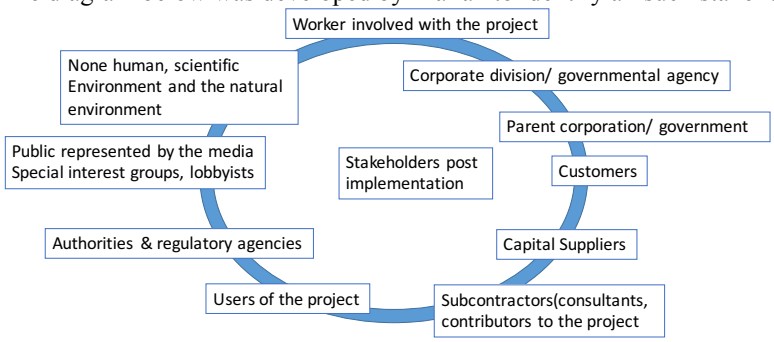


Fig 1: A stakeholders model [20-22].

In other words, each actor would exchange service (value) with one or more of the actors depicted in the diagram, and will also be a beneficiary actor. It is essential to acknowledge that only actors can determine the value-in-use.

### 3.1 Project lifecycle and the journey of value

Project lifecycle has four distinct phases: initiation, planning, execution and closing. The project manager uses monitoring and controlling to manage the project through this lifecycle. [1, 11, 17]. During the initiation phase, a project’s concept and perceived value is proposed. Stakeholders are then tasked with deciding whether to go ahead with the project or not. A decision is usually supported with value analysis based on the iron triangle (or any other product based indicator)[1]. Once a decision is made to go ahead with the project, further detailed planning takes place, which identifies the project resource requirements, the estimated time and cost of the project, and any perceived threats and opportunities are also identified. This would then be used as the basis for a full and formal approval of the project go-ahead including allocation of estimated funding along with a risk margin. The project is expected to deliver the outcome based on this forecast.

Once funding is committed and planning is agreed, the project goes into execution mode. During this phase the project starts the acquisition and integration of resources to achieve the outcome as defined in the project plan. Project delivery may follow a waterfall approach or incremental (iterative/agile cycle), delivering an outcome (value) to stakeholders, until the project is deemed to have achieved its objective. Once the project is deemed complete, a closure phase of the project life cycle is executed, during which the project transitions to an operational system, all unused project resources are disbanded, and only resulting outcome (value) remains in use. During the above phases (with the primary focus on execution), project managers along with stakeholders manage the project using a set of processes known as controlling and monitoring. The purpose of the control and monitor

processes is to make sure the project is heading in the right direction, and delivering value. The above project lifecycle postulates that:

1) Projects are initiated based on a proposed value outcome that is predefined at the start of the project. This means that a value exchange opportunity was identified, and stakeholders think that the proposed exchange is desirable; as such stakeholders (actors) engage to co-create that desired value.
2) Actors then engage into a process of planning which defines what resources, actors and processes that are needed to create the value-in-exchange. During this phase, value is yet to be created and what is actually happening is that the desired value exchange is being clearly defined. That is, actors or stakeholders agree on the parameters of the exchange (price, time and how) the value will be realized.
3) Once an agreement on the exchange parameters is achieved, then the project commences the execution cycle according to the agreed methodology. The agreed methodology defines how the value is exchanged. If a waterfall approach is adopted, then the value exchange takes place at the very end of the project, and value is co-created only at that point. If iterative methodology is adopted, then the value is exchanged and co-created incrementally.
4) The final phase of a project is closure. During this phase value is embedded into the normal operation, and the project outcome is now a resource that can be used in future value exchanges.

Based on the above, we can view the project value lifecycle in S-D logic as follows:

1) Value proposition (initiation).
2) Acceptance of value proposition and engagement to co-create value (planning).
3) Value is exchange between actors (depending on the methodology, project is executed).
4) Value is experienced (incrementally, or at end of project and the rest of the life of the resource depending on methodology, thus a more accurate value representation than traditional methods.

Acceptance of the project proposal and the agreement to co-create value are merely decisions in the value co-creation cycle. In the same context, planning and initiation phases are preparatory steps to help manage the execution and identify costs and benefits etc. In the traditional project lifecycle, which can be considered as part of the value proposal, the following diagram demonstrates this mapping:

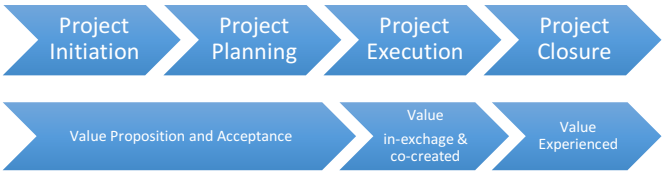


Fig 2:Project lifecycle and Value life cycle.

As such the project's value lifecycle is predominantly a three phase cycle: concept/initiation, build/execution and finally delivery (closure), then ongoing operation and maintenance. These condensed phases correspond one-to-one into the three phases of value co-creation being proposition and acceptance, value-in-exchange and co-created between stakeholders, and value experienced by the end-users (beneficiaries) of the project. The value co-creation cycle as depicted better capture the project value by considering value after the project is disbanded.

### 3.2 Assessment and measure of project value

Based on stakeholder theory, there are several stakeholders (actors) to an exchange, transaction or a project who seek to realize some value from participation [23-29]. Stakeholders are classified into nine groups [20, 21]. The stakeholders are organized in team(s) that work together by forming a web(s) for the purpose of sharing knowledge and skills to achieve project goals or deliver products [1, 5, 30-34] .Using S-D logic as a lens, these stakeholders are all co-creators of value[1] which is in turn experienced by each stakeholder. The nature of this experience can be positive, negative or neutral, and can be before, during or after the exchange. Additionally there is no absolute method to measure the experience among all stakeholders as "value-in-use is uniquely and phenomenologically determined by the beneficiary" [7, 10].

The process of planning and identifying, delivering, and realizing benefits is central to project management [35]. Through the S-D logic lens, this is viewed differently as proposed value, value in-exchange and co-created, and finally value in-use. These three components together are called value co-creation. In S-D logic value is experienced only by the beneficiary and is always phenomenological, and as such it does not have an absolute measure [6-8, 10, 36]. Additionally, value can be experienced before, during and after an exchange(s) [10]. As such, in S-D logic we depart from the traditional understanding of project value (or benefit management) as being a planned and measured outcome, to a more exploratory process that would require identification, capture and then measure after it has been experienced (please refer to the above supermarket example used in project value and assessment). In that example, value co-created by the project is continual, and will continue to exist and

[1] A componentry value of the overall project value (e.g. see Fig 3)such as the business requirement specification of the above example of supermarket checkout system development project being jointly specified (co-defined or co-created) by the responsible stakeholders such as the subject matter expert, end-user, and business owner.


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experienced as long as the supermarket is operational. In other words, the project value co-created is now part of the ecosystem, and will be continually realized whenever an exchange takes place using the resource created (the code). Since the ecosystem exists to survive (unlike the project) then it is not realistic to expect the project to measure value co-created, and the project would only be in a position to predict it. As discussed earlier, OPM would then have carriage of value-co-creation (being the institution within which the project has operated). OPM is then an enduring part of the larger ecosystem, where project management is the sub-organization that managed the project's complex exchange of services to deliver a new resource(s), that are then used in future exchanges to complete the value co-creation exchange.

### 3.3 Project value co-creation concise definition

Although projects have all the characteristics of an ecosystem, they are also by design: "transitional," "temporary," "entrepreneurial" or "time-bound" [11, 17]. However, value that is co-created by a project does survive into the ecosystem. Sankaran suggested that "In most societies, most markets are inefficient most of the time, thus providing opportunities for enterprising individuals to enhance wealth, etc." [37-39]. Stakeholder's theory views the market equilibrium as a "weak one, and subject to disruption by entrepreneurial processes when some stakeholders disagree with the value exchange proposed by the market" [38, 39]. With this in mind, projects can also be described as "entrepreneurial" activities that serve the project stakeholders to obtain value (or co-create value, using S-D logic terminology). Entrepreneurial process can also explain the reconfiguration of project organization at its conclusion; once the project is terminated, however, some resources and actors may not be reconfigured immediately but remain dormant in the system. Such actors and resources may on occasions resist the project transition to a value-in-use, as from their perspective, this transition may not result in a satisfactory value-exchange. As such, it is critical to understand the entire value exchange cycle in a project system. Mallak's work identified the stakeholders of any project that maps in S-D logic to the actors in the value exchange [20, 21]. These stakeholders are viewed in S-D logic as actors engaged in the value exchange within a project ecosystem. To ascertain whether value was created in a project ecosystem, it is essential to understand the value exchange that took place among the actors. It must also be noted that the value created by the project is the value that were exchanged in the system as a whole.

At any point in time, if we use a magnifying glass to closely examine the project and understand the exchanges within, we can observe all the exchanges that are taking place. The sum of all these exchanges contributes to the overall value co-created by a project. The following table demonstrates the values that exist in any project value co-creation exchange.

| | Non-human | Public | Authorities | Users | Subcontractors | Capital suppliers | Customers | Parent corporation | Corporate division | Workers involved |
|---|---|---|---|---|---|---|---|---|---|---|
| Non-human | $v_{00}$ | $v_{01}$ | $v_{02}$ | $v_{03}$ | $v_{04}$ | $v_{05}$ | $v_{06}$ | $v_{07}$ | $v_{08}$ | $v_{09}$ |
| Public | $v_{10}$ | $v_{11}$ | $v_{12}$ | $v_{13}$ | $v_{14}$ | $v_{15}$ | $v_{16}$ | $v_{17}$ | $v_{18}$ | $v_{19}$ |
| Authorities | $v_{20}$ | $v_{21}$ | $v_{22}$ | $v_{23}$ | $v_{24}$ | $v_{25}$ | $v_{26}$ | $v_{27}$ | $v_{28}$ | $v_{29}$ |
| Users | $v_{30}$ | $v_{31}$ | $v_{32}$ | $v_{33}$ | $v_{34}$ | $v_{35}$ | $v_{36}$ | $v_{37}$ | $v_{38}$ | $v_{39}$ |
| Subcontractors | $v_{40}$ | $v_{41}$ | $v_{42}$ | $v_{43}$ | $v_{44}$ | $v_{45}$ | $v_{46}$ | $v_{47}$ | $v_{48}$ | $v_{49}$ |
| Capital suppliers | $v_{50}$ | $v_{51}$ | $v_{52}$ | $v_{53}$ | $v_{54}$ | $v_{55}$ | $v_{56}$ | $v_{57}$ | $v_{58}$ | $v_{59}$ |
| Customers | $v_{60}$ | $v_{60}$ | $v_{60}$ | $v_{60}$ | $v_{60}$ | $v_{60}$ | $v_{60}$ | $v_{60}$ | $v_{60}$ | $v_{60}$ |
| Parent corporation | $v_{70}$ | $v_{71}$ | $v_{72}$ | $v_{73}$ | $v_{74}$ | $v_{75}$ | $v_{76}$ | $v_{77}$ | $v_{78}$ | $v_{79}$ |
| Corporate division | $v_{80}$ | $v_{80}$ | $v_{80}$ | $v_{80}$ | $v_{80}$ | $v_{80}$ | $v_{80}$ | $v_{80}$ | $v_{80}$ | $v_{80}$ |
| Workers involved | $v_{90}$ | $v_{91}$ | $v_{92}$ | $v_{93}$ | $v_{94}$ | $v_{95}$ | $v_{96}$ | $v_{97}$ | $v_{98}$ | $v_{99}$ |

Fig 3: Stakeholders knowledge product (integration) matrix contributing to value co-creation

In the example given above, 100 knowledge products were created that together measure the project value-in-use or value co-created, which can be represented as:

SK = stakeholder knowledge
K = product of an exchange between two stakeholders' knowledge.
VCC = value co-created
V = product of two stakeholders' knowledge
Pvcc = project value co-created
*dt* = time based temporal factor

Then, when two stakeholders' knowledge $SK_i$ and $SK_j$ exchange, the value outcome is the product (as it is not a linear relationship, as opposed to join which is a linear relationship) of this knowledge[40], or best expressed as:

$$V_{ij} = SK_i \cdot SK_j$$

Where *i* is a stakeholder in a row, and *j* is a stakeholder in a column. As such the value co-created at any given point in time during project execution is the sum of all products of knowledge at that point, or:

$$VCC = \sum_{e=0}^{99} V_e$$

Where *e* is the *ij* combination in the matrix.

However, value co-creation is a temporal process and the total value co-created by a project is the sum of all these values over time. This translates to a differential (function of time being infinitely divisible) equation as follows:

$$Pvcc = \int_0^t VCC \, . dt$$

In projects time has to be a fixed value as they are time bound; this concept is adopted here and in future research aiming to assess all A2A value exchanges. When we integrate all the concepts discussed earlier we can view projects as a function of time, as depicted in the diagram below:

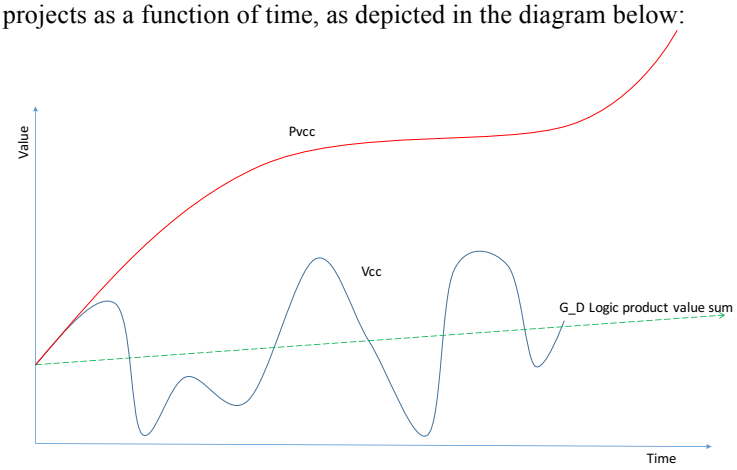


Fig 5: Value as observed during project lifecycle using VCC, Pvcc and traditional G-D Logic.

The red line is the full value co-created by the project, while the temporal line represents the value co-created at a given moment in time. The green line represents value as measured in G-D logic based on the sum value of all products. Note that the value co-created is unbounded so long as the ecosystem continues to exist. Furthermore, the value co-creation will grow extremely faster as the resources created by the project are used to create other resources etc. in other words, we would conclude from this definition value is unbound, and not measurable.

### 4.1 Conclusion and future directions

In this paper we presented a conceptual framework of project value co-creation lifecycle. We then used this view to define project value co-creation. This view is abstract and further work is required to validate it using empirical field data. We observed (using our abstract view) that, in S-D logic, projects are finite ecosystems. We also found evidence that the calculation of project value co-creation is possible and can be extended to cover before, during and after the project lifecycle, in other words it is a continual process. Furthermore, the value co-creation grows extremely faster as the resource(s) created by the project are used to create other resources etc.. In other words, from this definition value co-creation is unbound, and not measurable, unless it is time-bound.

We can also confirm the observation that projects are temporal i.e., they can change and are dependent on project compound knowledge at any given point in time. Using S-D logic as a lens provided us with clear processes to look at project value co-creation. While the process is still abstract at this point, further research is required to validate the method and perhaps identify more tangible ones to translate this abstract measure to a practical approach that will aid project managers in running their projects on a day-to-day basis. Another positive aspect about this proposed model is that it is time based, and captures the full value co-created by a project.

As such we also conclude from a project point of view, the full value of a project is then the product and not the sum of all values co-created (knowledge) and experienced phenomenologically by all stakeholders as defined in literature [19, 29]. Furthermore, full project value is temporal, hence it can only be captured once the full value is experienced. This by itself presents a challenge when assessing projects before completion as it presents a level of ambiguity at the outset and during execution. However, it also presents an opportunity to better measure the true, full value of a project by allowing for it to accumulate as the project progresses through its lifecycle. As a result, our proposed approach of using S-D logic as a lens, will be able to cast a wider net in which values co-created (before, during and after the project) are captured, observed and measured while also allowing for temporal project value at the same time. This understanding of value will improve our assessment of projects' successes and failures.

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