VIVA: A VIsual Language to Design VAlue Co-creation

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***Abstract*—This paper presents initial results on the design of VIVA: a visual language that aims to enable business users to design value co-creation for a given business or service context. VIVA is a language inspired by ideas in business modelling, marketing, service science and domain specific language (DSL) engineering. After describing our conceptual model and visual constructs, we illustrate and evaluate the use of VIVA by means of a case study in which a customer and a travel company co-create value within a travel journey. A subjective evaluation is also conducted based on the case study using a focus group of potential users. Later on, we provide some discussion on main assumptions, lessons learned and open challenges regarding the design of VIVA. Finally, we present conclusions and future work.**

***Index Terms*—Value co-creation; visual language; customer journey**

I. Introduction

Value co-creation (VCC) defined by Lusch and Nambisan as the "processes and activities that underlie resource integration and incorporate different actor roles in the service ecosystem" [1, p. 162], plays an important role in the design of services. For instance, within a travel service, both a traveler and a travel company must integrate their resources (e.g. knowledge, skills, and/or technology [2], [3]) to co-create a unique travel experience that is valuable for both of them.

Although there is not stable definition on VCC, there seems to be common ground on some of its properties. In this way, VCC usually deals with the co-creation of value between two or more (economic) actors via the exchange and integration of resources [4], [5], [1], [6], [3]. The value being co-created, however, is considered as an interactive relativistic experience [7], [3]. Because of such complexity, it is often difficult to design services that fully allow VCC between customers and service providers [8].

A. Running Example

As an example to illustrate the challenges regarding the design of VCC, we use the relationships taking place between customers and a travel company, which are basically series of joint activities in value co-creating for mutual benefits. The example is inspired by research conducted by Payne et al. [9], in which (after a workshop with managers and front line employees) they have identified important encounters between customers and a European travel company. We have chosen this example in our research because they addressed VCC as a process in which customers and suppliers relate to each other via *encounters* (i.e. "the processes and practices of interaction and exchange that take place within customer and supplier relationships and which need to be managed in order to develop successful co-creation opportunities") [9, pp 85-86]. Moreover, they also acknowledge that by focusing on encounters, one can identify opportunities for VCC [9, p 91].

Figure 1 illustrates a customer's travel journey that focuses on the end-to-end relationships between a customer and a European travel company [9]. Furthermore, it is assumed that VCC is incrementally and accumulatively achieved (or experienced) via a series of activities performed by both the customer and the travel company (e.g. all activities related to traveling to some destination) [9]. At the beginning of the customer's journey, the relationships are mostly informative. For instance, the travel company provides information regarding different travel plans via brochures, whereas the customer assimilates such information and mentally prepares for it [9]. As the journey evolves, however, the relationships change since the customer and the travel company must work together to address different situations such as the actual journey. In this way, the customer requires more (knowledge) support during the *actual journey* as she interacts with resources provided by the travel agency (e.g. means of transportation and accommodation) to co-create her own travel experience [9]. At each encounter, therefore, both the customer and the travel company not only engage in different ways but also integrate different resources (e.g. knowledge and skills) [9], [10].

In the same vein, Ballantyne and Varey [11], and FitzPatrick et al. [5] have already noted that customers and suppliers engage in different ways and apply different competences depending on the relationship in place. In this manner, each encounter is different and requires different resources from actors. As seen in Figure 1, these encounters can give rise to full customer journeys that actually allow the co-creation of value between customers and suppliers [12].

B. Problem Definition and Research Objectives

Despite the progress in service-dominant logic (SDL) for the last ten years [2], [3], there is not any modelling language to support business users to design VCC for a given business or service context [13]. Our VIsual language to design VAlue

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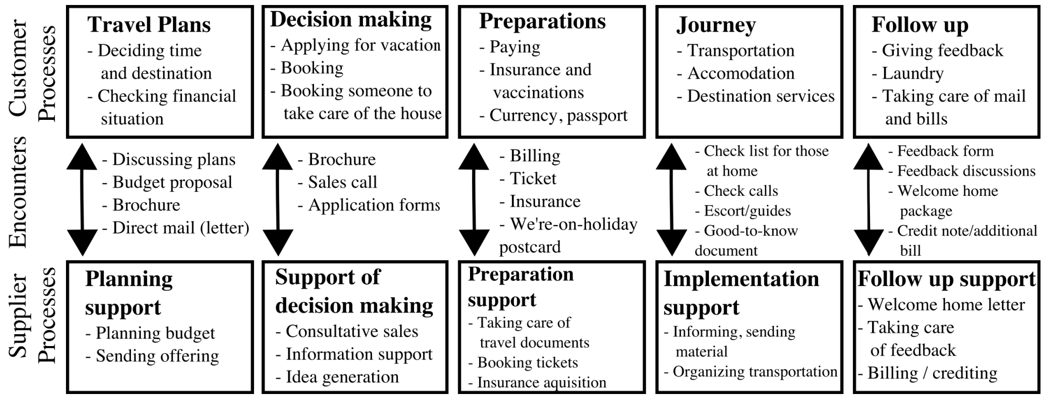

Fig. 1. Travel journey adapted from [9].

co-creation aims to fulfil this gap by supporting the design of VCC from a customer journey perspective. This is an important requirement when business users start developing services as they will need to specify required investments to support VCC. Such investments could include resources, rules, actors, etc. [3].

In this vein, our language's objective is to enable business users to design VCC for a given business or service context by focusing on the design of encounters between a *customer* and service suppliers, which can therefore support expressing (1) resources being integrated, (2) actors and their roles in a service, and (3) the different ways to engage in a given form of VCC.

The main contribution of this paper is, therefore, the *first design* of the VIVA visual modelling language. VIVA is inspired by research work in the fields of business modelling, marketing, service science and domain specific language (DSL) engineering [4], [5], [6], [3]. Moreover, VIVA is part of the ValCoLa (Value Co-creation Language) [1] [2] research project that aims to develop a modelling framework for VCC. ValCoLa has already defined an initial ontology that captures the main elements in VCC [14], whereas VIVA builds upon such initial ontology and contributes to the project by focusing on a customer perspective.

We have addressed the endeavour of building VIVA from a design science research (DSR) perspective [15], [16], [17]. According to DSR, VIVA represents the artifact being designed. Furthermore, the previous paragraphs have already *presented and motivated the problem at hand*. Likewise, Sect. II presents relevant literature to design VIVA, whereas Sect. III provides the *definition of the objectives for a solution* (i.e. a visual language) as well as the *design and development* of VIVA. Afterwards, Sect. IV *demonstrates* the use and *evaluation* of VIVA based on secondary data produced by [9], which is also assessed via a subjective evaluation with potential users. Sect. V then presents a discussion, where main assumptions, lessons learned and open challenges are described. Finally, with the aim of *communicating* a complete paper, Sect. VI concludes our paper with main findings and future work.

[1]https://www.alexandria.unisg.ch/id/project/245779

[2]https://www.fnr.lu/projects/value-co-creation-language/

II. Literature Review

As suggested by DSR [17], this section includes the descriptive and prescriptive knowledge that is relevant to address the design of VIVA. The former is the "what" knowledge related to the natural phenomena (i.e. VCC at a micro-micro level), whereas the latter is the "how" knowledge that is concern with the building of artifacts [17]. In this way, we have analysed work related to not only the notion of value, co-creation and customer journey (i.e. descriptive knowledge [17]) but also business modelling tools and language engineering (i.e. prescriptive knowledge [17]).

A. On Value and Co-creation

Several authors consider the notion of *value in use* as an important driver within the VCC process [18], [4], [10]. Furthermore, in [9] and [10], the authors consider that value in use comprises personalization, relationship, and experience. Personalization requires customer orientation via joint, reciprocal, and iterative processes that form the basis of the relationship between customers and suppliers, whereas experience is derived from customers' interaction with operand and operant resources [10].

Along this line, Holbrook has previously proposed a typology of customer value (understood as an *interactive relativistic preference experience*) that defines economic, social, altruistic and hedonic values [7]. Economic value relates to experiences that fulfil utilitarian objectives (e.g. when looking for time-efficient ways to go from point A to point B). In contrast, social value refers to experiences that may trigger the response of others (e.g. status-enhancing impression by travelling to fashionable destinations). Like social value, altruistic value also refers to experiences that may affect others' behaviour but such experiences do actually have an intrinsic (self-justifying) nature (e.g. charitable actions). Finally, hedonic value refers to experiences that are appreciated for the simple pleasure they provide to yourself (e.g. gazing at the landscape).

Regarding co-creation of value, Ballantyne and Varey [11] as well as FitzPatrick et al. [5] have identified the existence of at least three forms of interaction that lead to value co-creation: *co-ordination*, *co-operation* and *collaboration*. According to [11], [4], [5], *co-ordination* is an informative and persuasive interaction in which an actor tries to coerce or dominate the other (implying a certain degree of information asymmetry), whereas *co-operation* is a communicational interaction that is perceived as a more equitable exchange between actors. *Collaboration*, however, is an emergent dialogical interaction in which actors learn from each other and closely co-create value. By the same token, Payne et al. have also suggested that customer and supplier relationships occur in the context of encounters in which they both link their processes by applying core competences such as learning and knowledge [9].

Lately, Storbacka, et al. [6] have analysed the role of actor engagement to understand VCC. They argue VCC is a macro level concept whose causal activities can only be observable (and executed) at a micro level [6]. To this end, VCC occurs in a sequence of three mechanisms: *situational* (macro-micro), *action-formation* (micro-micro), and *transformational* (micro-macro) mechanisms [6]. Macro-micro mechanisms refer mostly to actors (e.g. humans and machines) and platforms (e.g. environments containing artifacts, interfaces, processes and people). Micro-micro mechanisms deal with actors' dispositions and engagements' properties (e.g. coordination, cooperation and collaboration), whereas Micro-macro mechanisms cover different resource (i.e. knowledge) integration patterns (e.g. choreographies) [6]. Finally, although excelling at individual actor-to-actor interactions is important, VCC is also highly influenced by the whole journey as experienced by the end customer [12]. In this sense, a customer journey, understood as the cumulative experience spanning across multiple encounters, must try to guarantee actual VCC between the customer and suppliers [12].

B. Existing Visual-Tool Artifacts

Well-known business modelling tools are either company or network centric, i.e. customers are seen as second-class citizens during the modelling process [19], [20]. *e^3-value* offers value-based modelling constructs to design business webs (networks) that are composed of several companies working together in a service delivery process [20], whereas the business model canvas (BMC) uses nine building blocks to design a business idea from the perspective of a company [19]. BMC has been recently enhanced with the so-called Value Proposition Canvas (VPC) that attempts to look closer at the interactions between a customer and a supplier (company) [21]. VPC, however, lacks support to specify the way customers and suppliers are supposed to interact, i.e. the notions of encounters and customer journeys are missing.

Lately, the VISUAL project has proposed a visual language for service design [22], [8]. VISUAL uses three terms to design services: touchpoint, action and customer journey. According to [22], a touchpoint is a form of communication or interaction between a customer and a service provider, an action is an event or activity conducted by a customer or service provider as part of a customer journey, and a customer journey is a sequence of actions and touchpoints that are performed to achieve a goal. VISUAL distinguishes between expected and actual journeys. The former is the journey pre-designed by the service provider, whereas the latter is the real journey experienced by the customer. From our point of view, VISUAL terms are very accurate to describe customer journeys and even perform elaborated analyses such as exposing the gaps between expected and actual journeys [8]. VISUAL, however, lacks the capacity to differentiate among coordination, cooperation and collaboration relationships, which are relevant to allow resource integration between customers and provider(s) [11], [4], [5].

C. Language Design

To the best of our knowledge, there are two widely spread approaches to design domain specific languages (DSLs) [23], [24]. Frank presents a methodology to designing DSLs [23], which covers seven steps (clarification of scope and purpose, analysis of generic requirements, analysis of specific requirements, language specification, design of graphical notation, development of modelling tool, and evaluation and refinement). In a similar fashion, Karagiannis proposes the so-called Agile Modeling Method Engineering [24], which consists of five phases (creation, design, formalisation, development, and deployment/validation). Both methods emphasise the importance of and impact of requirements on the overall design process. Karagiannis' approach attempts to apply principles from the agile manifesto for timely reacting to changes in requirements, whereas Frank's method pays a lot of attention to carefully analysing requirements before starting the design of the language. In fact, the first three steps in Frank's method deal with such issue (i.e. clarification of scope and purpose, analysis of generic requirements, analysis of specific requirements). Likewise, both methods actually rely on an iterative and incremental process in which inter&intra feedback loops support the overall design.

For the design of our language, we have decided to follow Frank's method since it provides more details for applying his guidelines and also emphasises the importance of graphical notations, which impacts the usability of the final DSL [23]. Moreover, we have actually combined Frank's method with guidelines provided by Moody for constructing visual notations [25], which is explained in the next section.

III. Method and Artifact Description

As explained in Sect. I, we follow a DSR perspective to design VIVA. Furthermore, Sections I and II have already presented and motivated the significance of the problem to be solved, i.e. the design of our artifact. In this section, we provide the definition of the objectives for a solution as well as present the current design and development. To this aim, we apply Frank's method [23], which is composed of seven steps as depicted in Figure 2. In this work, nonetheless, *we only cover the first five steps as well as the last one* since the sixth step requires actual software implementation, which is out of the scope of this paper [23].

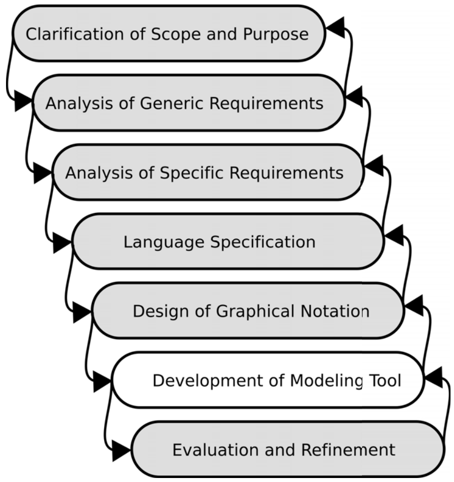

Fig. 2. A method to design DSLs [23]. The development of modelling tool (in white) is not covered in this paper. The evaluation and refinement are presented in Sect. IV.

A. *Clarification of Scope and Purpose*

In line with our research objective in Sect I, the purpose of our visual language is **to enable business users to design and model their desired value co-creation processes for a given business or service context at a micro-micro level** [6]. In this way, VIVA can later on be used in combination with other methods to design, analyse and commercialize new services. For instance, if successful, it will satisfy the modelling requirements of the seven-step integrated service innovation method (iSIM) [26], in which the second step focuses on designing a unique customer value proposition (CVPs), which specifies the values that the firm aims to co-create with the targeted customer segment.

B. *Analysis of Generic Requirements*

To achieve our main goal, we must meet at least four generic requirements, which are explained as follows:

- **GR1 (VCC design)**: The language must enable business users to represent the most important elements to design VCC at a micro-micro level for a given business or service context (e.g. a travel journey).
- **GR2 (Communication):** It should not only be easy to learn and understand but also support transferring ideas among stakeholders, i.e. facilitating communication. This requirement is related to the idea of supporting the *extrovert* role of final language users that must transfer the right message to stakeholders in a simple and intuitive fashion [27].
- **GR3 (Analysis):** Although the purpose of our language is to design VCC, it should also be able to support the evaluation of resulting designs. This requirement is related to the idea of supporting the *introvert* role of final language users that need some formality in the language to drive analysis [27].
- **GR4 (Computer support):** The final design must be implementable in a software tool to allow (semi) automatic design and analysis of VCC.

C. *Analysis of Specific Requirements*

On the one hand, to refine our first generic requirement, we have analysed our running example and formulated some questions that can help us to properly understand VCC at a micro-micro level [23]. The questions being formulated are mostly related to the encounters within the travel journey [9]. For instance, based on our running example, we can ask ourselves: What are the resources applied/used by the customer and the travel company at each encounter? and what kind of relationship is required at each encounter?. In this way, we can define specific requirements to answer our questions. On the other hand, the other requirements (GR2, GR3 and GR4) have been refined based on what is already supported by solutions such as BMC, e^3-*value* and VISUAL [19], [20], [22]. The set of specific requirements is explained as follows:

- **SR1 (Resources):** The language should be able to represent relevant resources that are integrated as part of VCC. Related to GR1.
- **SR2 (Forms of co-creation):** Describe different forms of VCC within a customer journey, i.e. co-ordination, co-operation and collaboration. Related to GR1.
- **SR3 (Beneficiary centric):** Rather than focusing on the firm or its network, the design should focus on the beneficiary of VCC, i.e. the relationships (encounters/touchpoints) established between an end customer and suppliers of a service ecosystem. Related to GR1.
- **SR4 (Background agnostic):** Intuitive use for technology-oriented as well as business-oriented audiences. Related to GR2.
- **SR5 (Visual support):** Visual constructs should help users to design VCC at a micro-micro level. Related to GR2.
- **SR6 (Semantic support):** It should be able to perform basic reasoning tasks. Related to GR3 and GR4.
- **SR7 (Standardised representation):** Use a “formal” meta-meta modelling tool. Related to GR3 and GR4.

D. *Language Specification*

As explained in [23], this step mostly covers the development of a “concept dictionary” and the design of a meta model. Tables I to IV represent our concept dictionary, whereas Figure 3 illustrates our meta model (in grey) and the meta model plus relevant sub-concepts respectively. All concepts and relationships are inspired by research findings [18], [10], [28] coming from the descriptive knowledge in Sect. II-A [17]. Moreover, as suggested by [23], this specification has been iteratively improved based on both the descriptive knowledge and the preliminary versions of the language [29], [30] as well as on the initial ValCoLa ontology [14].

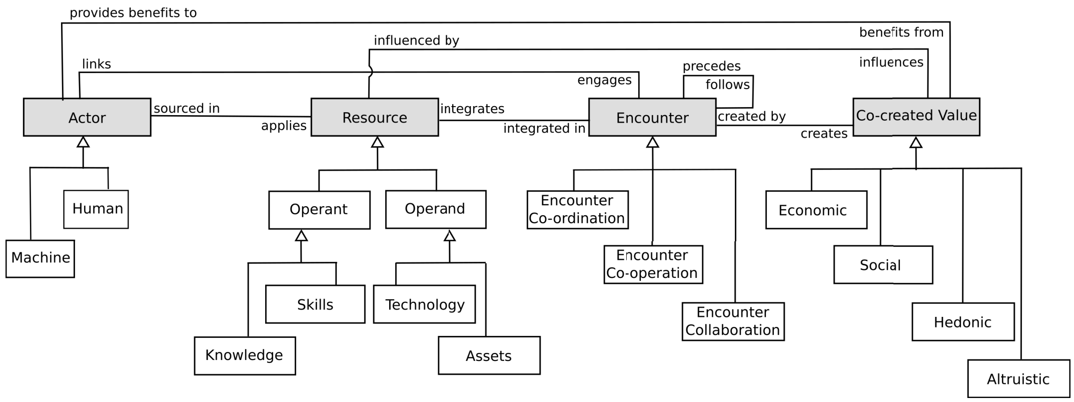

Fig. 3. Metamodel with sub-concepts for all relevant concepts.

An encounter is an action-formation mechanism that represents the contact point between two actors participating in VCC [11], [9], [12], [5], [6].		
Related concepts	Actor, Co-created Value and Resource.	
Relationships	*integrates*	An encounter provides the interaction space to integrate resources from actors.
	links	An encounter links actors taking part of VCC.
	creates	By facilitating the interaction between actors and the integration of resources, an encounter creates value.
	follows	An encounter can follow another encounter.
	precedes	An encounter can also precede another encounter.
Example	A guided tour in which a traveler interacts with a guide.	

TABLE I
ENCOUNTER.

A resource can be of two types: operant or operand. Operant include knowledge and skills. Operand are mostly technology and physical assets [2], [3], [14].		
Related concepts	Actor, Encounter and Co-created Value.	
Relationships	*integrated in*	A resource is integrated in an encounter.
	sourced in	A resource is sourced in an actor.
	influences	A resource influences the co-created value.
Example	Information about guided tours.	

TABLE II
RESOURCE.

An actor is any participant of a value co-creation process [9], [6], [14].		
Related concepts	Encounter, Resource.	
Relationships	*applies*	An actor applies resources during the value co-creation process.
	engages	An actor engages to an encounter to co-create value with another actor.
	benefits from	An actor benefits from a co-created value.
Example	A traveler or a machine.	

TABLE III
ACTOR.

It represents the (new) value being co-created at the encounter. As defined by [7], it is "interactive relativistic preference experience".		
Related concepts	Encounter, Resource.	
Relationships	*created by*	Value is co-created at the encounter via co-ordination, co-operation or collaboration.
	influenced by	The final co-created value is influenced by the resources.
	provides benefits to	The co-created value provides benefits to an actor.
Example	A personalised tour.	

TABLE IV
CO-CREATED VALUE.

Regarding the main concepts and relationships in Figure 3: an actor *applies* resources, which are *integrated in* an encounter that facilitates the *creation* of value by allowing the *engagement* of actors [11], [9], [5], [6]. The co-created value is ultimately *influenced by* the resources being integrated.

The actor sub-concepts are defined based on recent ideas regarding actor engagement within VCC [6], whereas the resource sub-concepts have been defined based on SDL axioms [3] and current revisions to those axioms [31].

Likewise, the encounter sub-concepts are defined based on ideas from marketing and management communities [11], [4], [5], which describe three forms of engagement: co-ordination, co-operation and collaboration. Being co-ordination and collaboration the lowest and highest levels of engagement respectively (with co-operation seen as a moderate level of engagement). Finally, the co-created value sub-concepts (i.e. economic, social, hedonic and altruistic) are inspired by studies on consumption experience and customer value [7]. For encounter and co-created value see also Section II-A.

E. Design of Graphical Notation

During the design of our visual constructs we followed and tried to cover the nine design principles suggested by Moody [25], which are summarised in Table VI. Briefly, we only left out the cognitive integration principle since we are not considering the integration of any other model(s) yet. We defined constructs per each sub-concept in Figure 3 as they help to highlight the involved actors, the resources being integrated and the different forms of engagement during VCC.

Finally, we also define a design plane composed of three sub-planes that correspond to the three forms of actor engagement. Figure 4 illustrates the threefold VIVA plane, which helps to place encounters on either the co-ordination, co-operation or collaboration sub-plane. The use of this plane is aimed to support cognitive fit (i.e. representational medium) by offering a drawing space that can be easily replicated on whiteboards, paper and computer-based drawing tools [25].

IV. Use and Evaluation

To illustrate the use of our visual language as well as to determine whether it has satisfied both generic and specific requirements [23], we have used the visual constructs to model the travel journey presented in Section I-A. First, we introduce the IDEA mechanism [25], which helps designing VCC by focusing on the encounters between customers and suppliers that occur as part of a customer journey at a micro-micro level [6]. Second, we present the customer's expected travel journey as modelled using our constructs and applying the IDEA mechanism. Third, we check to what extent our visual language satisfies the generic and the specific requirements. Last, in accordance with DSR [17], we use VCC subject matter experts to evaluate the utility (i.e. validate the design) of VIVA.

A. How to use the visual constructs

The use of our visual language is ruled by the IDEA mechanism, which represents the *visual grammar* (i.e. a set of compositional rules) [25] and is described as follows:

- **I**dentify encounters: This step focuses on meaningful interactions in which actors must be involved within a customer journey. In this way, the user/modeller should identify the main encounters that take place between a customer and an actor or group of actors as part of a customer journey.
- **D**efine the form of interaction per each encounter: Based on the definitions provided by [11], [4], [5] and presented in Section II. The user must define the desired interaction per each encounter (i.e. co-ordination, co-operation or collaboration). For instance, informative interactions can be modelled using co-ordination encounters. This helps users to choose the shapes of encounters and to "forecast" the resources that would be involved. Moreover, the shapes must be placed within the corresponding sub-plane of the threefold VIVA plane (see Figure 4).
- **E**laborate on the integrated resources and the co-created value(s): At this step, the user elaborates on the operant (i.e. knowledge and skills) and operand (i.e. technology, physical assets) resources that should be integrated to realise the desired co-created value(s). It is important to mention that encounters allow to co-create more than one type of value (i.e. economic, social, hedonic and/or altruistic).
- **A**ssign actors: Once the encounters and resources have been defined, the user must assign actors that can integrate the resources required at each encounter.

B. Travel journey

Figure 5 illustrates a (expected) travel journey that has been modelled using our visual constructs. The way in which the IDEA mechanism has been applied is explained as follows:

- **I**: The encounters composing the travel journey have been already identified by Payne et al. [9] (see also Figure 1). For our case study, we assume five encounters: *Budget proposal* (planning), *Application forms* (decision making), *Billing* & *Insurance* (preparation), *Guided Tour* (journey) and *Feedback discussions* (follow up).
- **D**: Budget proposal and application forms can be modelled as co-ordination encounters as they are mostly informative interactions in which an actor (the travel company) tries to coerce/convince a customer, i.e. this is not an equitable exchange since the travel company dominates the interaction due to its "control" on travel information options. In contrast, we use a co-operation encounter to model the billing & insurance interaction since this is a more equitable exchange of information, i.e. once the customer has acquired a better understanding about traveling options and made a decision, she can be more actively involved in the preparation (e.g. deciding what kind of insurance is required for her). The guided tour and feedback discussions are modelled as collaboration encounters because of the active involvement of the traveller to take transportation options as well as providing informed feedback. Once the encounters are defined, the corresponding shapes are placed within the threefold plane as depicted in Figure 5.
- **E**: The required resources and the expected co-created value per each encounter are illustrated in Figure 5. All resources and the co-created values are defined based

Encounter	Coordination	Cooperation	Collaboration	
Co-created value	Economic	Social	Hedonic	Altruistic
Resource	Knowledge	Skills	Technology	Assets
Actor	Human		machine	

TABLE V
VIVA CONSTRUCTS TO DESIGN VALUE CO-CREATION.

Principle	Description	Covered?	How?
Semiotic Clarity	One to one correspondence between semantic constructs and graphical symbols.	Yes	Relevant concepts in Figure 3 are mapped onto visual constructs in Table V.
Perceptual Discriminability	Symbols should be clearly distinguishable from each other.	Yes	Constructs in Table V are distinguishable from each other.
Semantic Transparency	Visual representations whose appearance suggests their meaning.	Partially	The visual constructs represent in a very simple way the sub-concepts in our metamodel.
Complexity Management	The ability of a visual notation to represent information without overloading the human mind.	Partially	Given the few number of elements in our visual language, we think that the language will not overload the mind of the final users.
Cognitive Integration	Mechanisms to support integration of information from different diagrams.	No	Not considered yet.
Visual Expressiveness	Full range and capacities of visual variables.	Yes	We use visual variables in the design of our constructs, e.g. shapes, colour intensity, orientation, size.
Dual Coding	Text to complement graphics.	Partially	Our constructs allow including text to increase understanding.
Graphic Economy	The number of symbols should be cognitively manageable.	Yes	Our visual language is composed of 11 constructs, which do not represent a burden to the final user/designer.
Cognitive Fit	Different visual dialects for different tasks and audiences.	Yes	The metamodel in Figure 3 can be used by technology-oriented people, whereas the visual constructs can be used by any person.

TABLE VI
DESIGN PRINCIPLES FOR GRAPHICAL NOTATION [25].

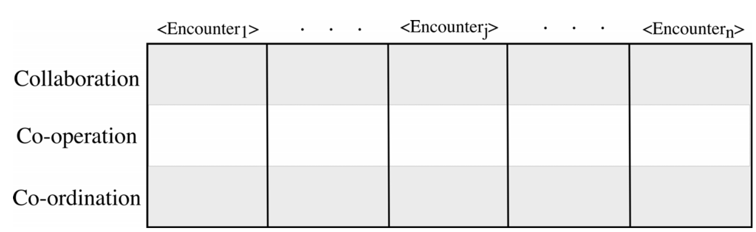

Fig. 4. The VIVA Plane aims to provide an easy visualisation to distinguish among the nature of the encounters. The plane is composed of three sub-planes (co-ordination, co-operation and collaboration) where up to n encounters can be placed. Each encounter is placed only at a given sub-plane depending on the engagement being required.

on our experience as travellers. For instance, within the *guided tour* encounter, from the customer's perspective, the values being co-created are economic (i.e. by having a tour), altruistic (i.e. via an ecotour) and hedonic (i.e. by enjoying the landscape during the tour). From the company's perspective, however, the main value being co-created is purely economic (i.e. providing a tour).

- **A**: The final step is to identify the actors (human or machine) that can apply the required resources. As depicted in Figure 5, we assume a human to machine (or automated software solution) interactions in the first three encounters. The last two, however, require human to human interaction as the encounters (guided tour and feedback discussions) are actually dialogical interactions in which traveler and supplier learn from each other [11], [4], [5]. Note that the customer is always the same in every encounter and is identified as C, whereas the company actors can be different at each encounter (because different resources are required). In this way, VIVA supports modelling the integration of resources from multiple actors.

C. Evaluation

At this stage, as suggested in [23], we determine whether specific and general requirements are satisfied. Second, we present an initial evaluation based on our travel journey example.

1) Checking requirements: Even though we have tackled and satisfied all the specific requirements, we acknowledge that some elements must be improved. For instance, we can explore other ways to support the representation of resources (SR1) as well as analyse whether other visual constructs can be designed (SR5).

Similar to specific requirements, the solutions to some generic requirements must be improved and others must be actually solved. For instance, computer support (GR4) is important on its own but can also support the analysis of more case studies, which can improve our language and better understand VCC at a micro-micro level.

2) Perceived usability: Working individually with the members of a group of potential users, we have applied a three-step approach to evaluate the perceived usability of VIVA. First, we have introduced and explained the main VIVA constructs to every single member of the group. Second, we have asked them to individually design a customer journey using VIVA constructs and the IDEA mechanism. Finally, using a Likert scale, the group answered to the set of questions presented in Table VII. The results are summarised in Figure 6. All the participants (ten out of ten) **agree** that the VIVA language seems to be useful overall (Q7). Likewise, eight out of ten **agree** that the VCC concept at the micro level is understandable, whereas two of them **strongly agree** to such claim (Q1). Seven of them **agree** that the symbols can be clearly distinguished and that shapes help doing that (Q2 and Q6 respectively). On the downside, six of them are **neutral** to the claim that the symbols faithfully reflect their meaning (Q3), which is understandable given our basic and simple visual constructs.

Regarding Moody's guidelines, the results help us to positively validate our claims in Table VI since most of the participants agree to such claims (see also Figure 6). In this way, perceptual discriminability was assessed by Q2, semantic transparency by Q3, graphic economy by Q4, visual expressiveness by Q5 and Q6, Furthermore, semiotic clarity, complexity management, and cognitive fit are achieved as a whole and finally (subjectively) verified by Q7.

Finally, the group was composed of ten participants of the 5th International Conference on Serviceology [30]. Table VIII presents the demographic information of the group. As one can see, most of the participants have a technical background and Japanese nationality.

V. Discussion

The content of this section is twofold. First, we present some lessons learned that are based not only on our experience designing VIVA but also on what similar efforts have contributed to (business-oriented) visual modelling. Second, we describe open challenges that can be addressed to improve VIVA as well as our understanding on VCC.

A. Lessons learned

During the design of VIVA we have learned several things. First, we have observed that the VCC concept has not yet reached a stable definition.

Second, the proposed VIVA plane seems to already provide an easy visualisation to distinguish among the nature of encounters within a customer journey.

Third, from the IDEA method (see Sect. IV), the **E** step related to elaborating on resources and co-created value is one of the most challenging ones (also noted by Payne et al. [9, p 91]). This is specially true for knowledge and skills that must be integrated to co-create different types of value [31, p. 4]. Therefore, when taking care of this step, it is desirable to work in close collaboration with customer journey experts in the given domain. In our case, although we heavily rely on our own travel experience (to which the reader can also relate to), we must still evaluate and validate our customer journey (Fig. 5) with experts in the travel sector.

Finally, within the design of graphical notations, the guideline defined as *semantic transparency* is the most difficult to fulfil/follow [25]. As also recognised by Frank [23], (we) language designers are not usually experts in the design of iconographic symbols. A possible way to address this issue, it is to involve professional graphic designers and thoroughly test the effectiveness of the visual constructs [23].

B. Open challenges

Starting from "minor challenges", we need to identify more case studies where VCC actually occurs so that we can evaluate and refine our language. Later on, we need to improve our visual constructs to effectively design with different stakeholders encounters that lead to VCC between different actors.

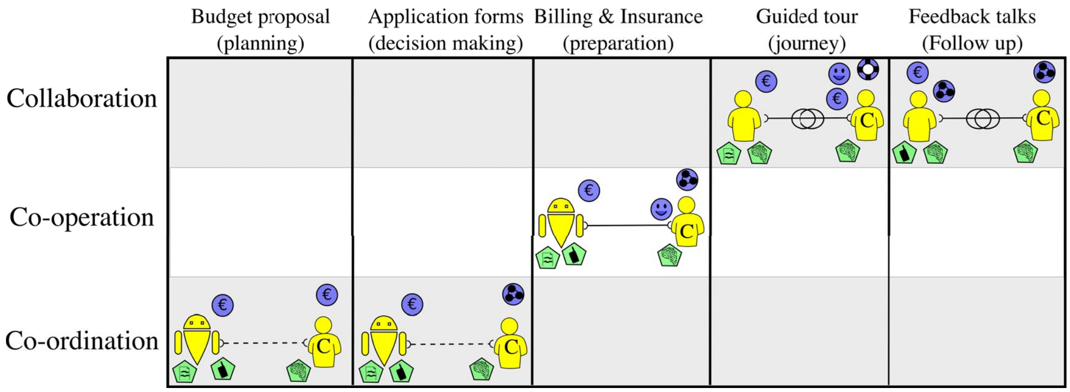

Fig. 5. Visual description of a travel journey that focuses on the encounters between a traveler (customer) and a travel company (supplier).

Code	Question
Q1	After the explanation, I understand the concept of value co-creation (VCC) at the micro level?
Q2	I can clearly distinguish symbols from each other
Q3	The symbols faithfully reflect their meaning
Q4	The number of symbols is manageable
Q5	The use of color helps to distinguish symbols
Q6	The use of shapes helps to distinguish symbols
Q7	The VIVA language seems to be useful overall

TABLE VII
QUESTIONS

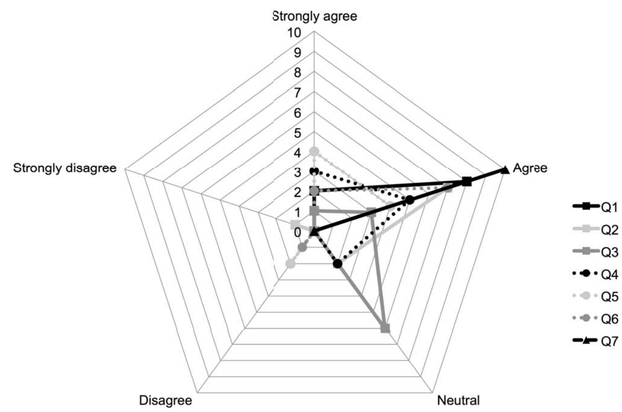

Fig. 6. Results of the evaluation

Country	Japan	7	Austria	1	Czech Republic	1	Vietnam	1		
Age	< 30	2	$30 - 40$	2	$40 - 50$	3	$50 - 60$	2	$60 >$	1
Background	Technical	7	Business	3	Social Sciences	3				
Note: Three participants reported more than one background, i.e. technical-business (1), business-social (1) and technical-social (1).										

TABLE VIII
DEMOGRAPHICS.

We should specially pay attention to ways to improve so-called semantic transparency in our visuals [25]. Likewise, VIVA needs to improve the way relationships between concepts are visually modelled. For instance, some relationships are modelled in terms of relative positioning (e.g. a resource next to an actor suggest that the actor *applies* such resources), whereas other relationships are not yet visually modelled (e.g. the *influences* relationship between co-created value and resource). Note, however, that maybe not all the relationships need to be visually modelled.

Among the “major challenges”, we still need to guarantee that VIVA can faithfully represent VCC at a micro-micro level while also keeping in mind the meso and macro levels as well as integrating other high-level conceptual/theoretical foundations of service science and marketing [13], [3]. This integration must also take care of several sub-challenges. First, how to clearly map high-level foundations onto generic and specific *requirements*. Second, since the co-created value as perceived by the beneficiary highly depends on the (social) context [3], future versions of VIVA should also be able to specify such *context*. Third, although VIVA focuses only on business-to-customer (B2C) relationships, it should be able to also generalise VCC to business-to-business (B2B) settings. Fourth, VIVA is still lacking a mechanism/protocol to guarantee a smooth and clear transition from co-ordination, co-operation to collaboration. Finally, the so-called *institutions* [3] (“rules of the game”) that rule VCC must be specified during the design of the encounters.

VI. Conclusions and Future Work

We have presented the design of a VIsual language that aims to enable business users to design VAlue co-creation for a given business or service context at a micro-micro level (i.e. VIVA). VIVA focuses on designing customer journeys, which are composed of encounters between actors that allow the integration of operand and operant resources. Likewise, VIVA allows to distinguish among three forms of encounters (co-ordination, co-operation and collaboration) that have been identified as the interactions among actors guiding the integration of actors' resources in VCC [5].

To design VIVA, we follow a DSR approach that provides a research methodology to build our artifact (VIVA), whereas Frank's method and Moody's guidelines provide scientific rigour to build such artifact [16], [17]. Moreover, as suggested by DSR that stipulates iterative design-evaluate cycles (with users) to improve the artifact's design, this paper reports the first design-evaluate cycle, which is then ready to be communicated [15].

Future versions of our visual language will allow us to design and analyse other forms of VCC within real-world case studies. In this vein, as future work, we plan to analyse more case studies to not only gather other requirements and refine VIVA but also to validate and evaluate its usability, i.e. modelling VCC at a micro-micro level with different stakeholders. Furthermore, we should also address our main assumptions and solve the open challenges.

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