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## A holistic view of value generation process in a SSBI environment: a service dominant logic perspective

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### ABSTRACT

Self-service business intelligence (SSBI) is an emerging trend in organisations allowing users to become more autonomous in data exploration. Organisations are keen to provide such services for their employees due to its potential benefits. However, there is little empirical knowledge about the process of building a SSBI service and the role of users in this process. From an exploratory single case study of a major Norwegian online marketplace and drawing on service-dominant logic as an analytical framework, we identify and explore two major phases of building a SSBI service: co-production and co-creation. Besides providing a rich description of these phases, this study also explores the way stakeholders are involved and embedded throughout the process of value generation.

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Self-service business intelligence; service-dominant logic; co-production; co-creation

## Introduction

The nature of today's business demands that business intelligence (BI) extends to an operational level to support a variety of employees during their tasks (Böhringer, Gluchowski, Kurze, & Schieder, 2010) to minimise the risk of no fact-based decisions (Abelló et al., 2013). Often, BI specialists and/or other power users at functional departments are overloaded (Kobielus, Karel, Evelson, & Coit, 2009) by constant requests of reports from different organisational levels (Yu, Lapouchnian, & Deng, 2013). Self-Service Business Intelligence (SSBI) – as a new trend attracting industrial attention – promises to enable executives, managers, analysts and knowledge workers to not only access data, but also to be able to design and build reports based on respective needs (Abelló et al., 2013). In this way, an end-user becomes data producer in addition to the current data consumer profile. However, setting up a SSBI is not trivial and includes many touch points between an IT/BI department and business people, such as during selection of data sources and specifications of data field, data model and semantic layer (Imhoff & White, 2011). In general, the operational level in an organisation encompasses a wide range of employees (such as sales, marketing, operation and customer care). An ineffective design of SSBI (Imhoff & White, 2011), wrong or uneducated SSBI use during data selection and analyses might affect the quality of a business decision.

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Given the importance and criticality of SSBI and a lack of knowledge in the BI literature, it is important to have a sound empirical evidence of how SSBI is designed and implemented in practice. Drawing on service-dominant (S-D) logic (Vargo & Lusch, 2017) as a multidisciplinary, dynamic and evolving narrative of value co-creation, this study aims to explore and describe how a SSBI environment is built while considering the inter-relationship between IT staff, SSBI, and users.

### Self-service business intelligence in perspective

BI is 'a broad category of applications, technologies and processes for gathering, storing, accessing and analysing data to help business users make better decisions' (Watson, 2009, p. 491). BI addresses also the need for empowering users with access to create their own reports and sharing them with others. SSBI is one BI approach which enables such a capability by allowing various employees at different levels to independently build custom reports and explore previous ones relying to a very low extent on the IT/BI department (Abbasi, Sarker, & Chiang, 2016). Through SSBI the role of an end-user will shift from a simple data consumer to a more consumer–producer one (Bani Hani, Tona, & Carlsson, 2017), which involves processes of co-producing and co-creating with the IT staff; thus permitting users to not only exploit, but also explore data (Stodder, 2015).

Thus, SSBI is:

a new approach to BI that aims to increase the level of co-production and decrease the level of individual's dependency during user's engagement with a broad range of applications and tools comprehensively embedded throughout the process of solving an analytical task. (Bani-Hani, Tona, & Carlsson, 2018, p. 166)

Our adopted definition highlights three key elements vital to SSBI: technology, people and processes. The technology includes the SSBI platforms and tools that support the process of deploying and creating the data models. It is not our goal to explore the varieties of SSBI platforms and tools available in the market, however we put more emphasis on the people and processes involved in the SSBI environment.

### Service-dominant logic as an analytical framework

S-D logic has strong connections to IS research. It is depicted as the 'philosophical foundation for service science' (Maglio & Spohrer, 2008, p. 18) and is used for analytical work in several IS studies (see (Lusch & Nambisan, 2015; Yan, Ye, Wang, & Hua, 2010). The changing role of SSBI users, as well as our SSBI definition resonates well with service-dominant logic (Vargo & Lusch, 2004, 2008) as a multidisciplinary, dynamic and evolving narrative of value co-creation through resource integration and service exchange. The central concept of resource integration has been defined as 'the process by which customers deploy [...] resources as they undertake bundles of activities that create value directly or that will facilitate subsequent consumption/use from which they derive value' (Hibbert, Winklhofer, & Temerak, 2012, p. 2). The notion of customer–producer dyadic has been generalised to actor-to-actor networks (Vargo & Lusch, 2017). As a result, resource integration does not only highlight the active roles of customers and their knowledge and skills, but also those of other actors such as the four categories of SSBI stakeholders (Imhoff and White (2011).

At this point it is important to distinguish between the co-production and value co-creation. From the view point of Vargo and Lusch (2008), co-creation happens when the customer takes the firm's proposed value and integrates it with his or her personal resources to generate value, which is highly subjective to the beneficiary. In contrast, co-production involves the exchange of the operand and operant resources, and develops the proposed value (Sheth & Uslay, 2007). The operand resources are defined as 'resources on which an operation or act is performed to produce an effect' (Vargo & Lusch, 2004; p.2) such as the ATM and online banking platform; whereas the operant resources are the actual human capital that act on the operand resource and are characterised by intangibility such as knowledge and skills (Arnould, Price, & Malshe, 2006; Vargo & Lusch, 2004). Lusch and Nambisan (2015) highlight the role of Information Technology (IT) both as an operand and operant resource. That is, information technology is considered as operand when actors apply their knowledge and skills to produce a service. In similar vein, IT can also be considered an operant resource especially when IT plays an active or triggering role in producing a service (see Lusch and Nambisan (2015)). The interactions, resources and potential outcomes that make up the co-production of value propositions are likely to vary according to the social context in which co-production takes place (Edvardsson, Tronvoll, & Gruber, 2011). A further refinement of the distinctions between value co-creation, co-production and value-in-use has recently been offered by Ranjan and Read (2016) who describe co-production and value-in-use as subordinate concepts of value co-creation. This includes sharing of control and knowledge in interaction (co-production) as well as experience, relationships and personalization (value-in-use) (Ranjan and Read (2016)). Similarly Hilton, Hughes, Little, and Marandi (2013) remind us that value co-creation can take place even without co-production and considers it as a continuum. Consequently S-D logic should be fruitful to use as an analytical framework in the SSBI context.

## Research method

We adopt a single case study methodology as its idiographic nature suits the applied work of our study and empirical account (Hayes, Barlow, & Nelson-Gray, 1999) especially as the area of SSBI is empirically under-explored (Miles & Huberman, 1994; Yin, 2013). The research method employed in this study is qualitative interviews, as we believe that the interview technique will provide rich descriptions (Schultze & Avital, 2011) and insights in understanding how SSBI is built through the collaboration of the IT/ BI and employees.

## Empirical site

Our empirical site was a digital marketplace organisation. This organisation has become a central data repository where agencies (private and governmental) constantly send requests in regards to various statistical analysis and ad hoc reports. In addition, high profile sellers are requesting reports from marketing and sales departments concerning their advertisement reach and investment values. Due to the increase in ad hoc requests from different external customers and internal employees in 2010, the management decided to build a more data driven organisational environment where employees could easily access organisational data and work with it to perform their daily tasks more independently.

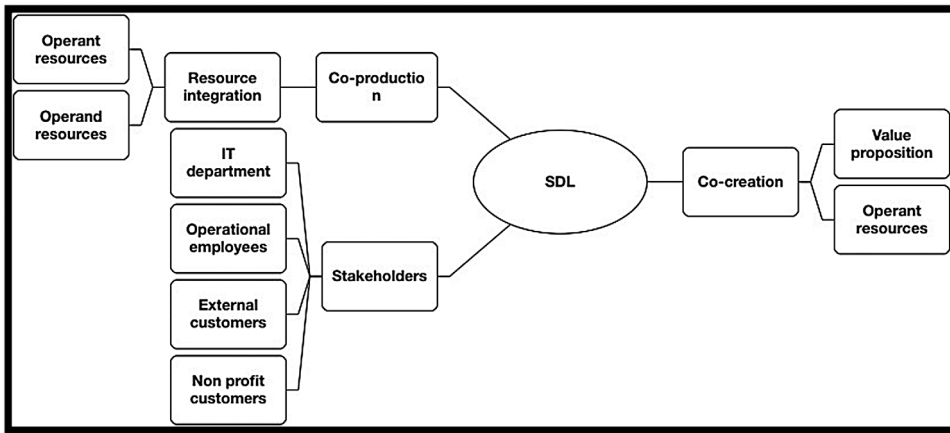


Figure 1. Concepts map.

### Data analysis

13 interviews are performed face-to-face and all interviews were recorded (after receiving the consent of the interviewee), transcribed and loaded into NVIVO11. Based on the SDL concepts and their inner elements, a map was created to graphically illustrate the relations and structure of SDL components, such as co-production and co-creation to create the basis for further analysis (see Figure 1). This map is used as an analytical lens to understand the SSBI environment and to develop a holistic view of the value creation process.

## Findings

### Co-production

During co-production a variety of resources are exchanged among actors in an SSBI environment, categorised as operant and operand resources.

*Operant resources* – provided by stakeholders to build a SSBI environment – are exchanged among the IT staff and business users during the co-production phase. The IT staff has access to the enterprise data warehouse and other data sources (internal such as price statistics data; and external, such as Facebook and Twitter). To create the required data models, the IT staff should have knowledge about the available data sources; the ETL (extract-transform-load) process and should employ their advanced technical skills during the design and implementation of data models. Data models are developed and maintained through constant updates of data fields and sources and that requires time, technical resources and collaboration with business users. In turn, business users share their business experience, knowledge of industry and operational data to guide the IT staff in creating the most relevant and convenient data models for insight discovery and data exploration. ‘... You need to have business people articulate what they want to accomplish by using the system that you’re going to develop for them.’ [Business user].

*Operand resources* – Through features enabled by an SSBI environment, the IT staff can connect to different types of data sources, conduct data loading and check data consistency during the model development regardless of whether data sources have changed. ‘I would

say that we have everything from Excel sheets on shared drives to APIs that pulls data from different sources ... the data and the model, the representation to our end users is not going to change.' [Insight department].

*Resource exchange* – Through resource exchange stakeholders can continuously interact to define and finally deliver mutual valued benefits. In this case, the interaction occurs between the operational business employees and the IT staff to identify the target data-sets and sources.

The business users or the end users will be included at the beginning of the process and the end by trying to use the data model created then we typically check what dimensions; I mean aggregated data they need and how they need to slice or drill into this data to work with it. [Insight department]

This is an iterative process that includes a series of contacts integrating the expertise among stakeholders to fine-tune the data models provided towards a proposed value of SSBI.

*Value proposition* – Data models design is a resultant of the continuous effort of stakeholders to exchange operant and operand resources. This creates the ground for the value proposed to users. Business users can now access data, create reports, answer their ad hoc requests, explore new data sources and structure data in a more personalised and autonomous way. 'Self-service business intelligence would allow the people to add new data sources, establish new collection of data, structure them in a simpler, more self-service way' [CXO]. When users become more autonomous in their ad hoc requests, the IT staff is no longer overwhelmed by user requests and can focus more on the strategic and analytical tasks.

### **Co-creation**

During co-creation users engage in the SSBI environment and use the data models that are built during co-production. In co-creation, the proposed value is transformed into value in use where users can acquire the actionable benefits (Vargo & Lusch, 2004, 2008) provided by the SSBI environment. A user – an operant – integrates resources such as business knowledge, technical skills and time with resources imbedded in the self-service platform such as ease-of-use, data models, data source access and export functionalities.

*Operant resources* – During co-creation users, provided that they have necessary technical skills to be able to work in a self-service platform and utilise its functionalities and services, engage with the self-service platform to carry out a task. 'To do some work; some basic training they might require you to try to understand a little bit of the data and find out what you can get from the queries' [Insight Department]. Some interviewees highlighted the issue of trust. They mentioned that they lacked trust on the data. For this reason, often the IT staff was contacted to provide final confirmation. However, this influences the SSBI environment efficiency (i.e. autonomy and self-service). 'Maybe because of insecurity and maybe I want to double check if the numbers are correct ... make sure that the numbers that are popping up in the dashboard are correct, so that's a trust issue.' [Business user].

*Resource integration* – Users integrate their resources with the available SSBI resources. Users interact with the platform and utilise its functionalities through their technical skills. The SSBI functionalities such as drag-and-drop, visualisation building and aggregation selection are selected and used by users who understand the company business and the report context. Furthermore, through their analytical skills users are enabled to interpret data and

extract insights for their decisions and actions. 'To use SSBI users don't need any advanced skills at all, but in all fairness I think they need to have at least the basic understanding of the company X business model.' [Insight department].

*Value in use* – as defined earlier, is the evaluation of the service experience during the service consumption. Users can evaluate the service cognitively and identify the value-in-use during their engagement in the SSBI environment. The use of the self-service platform has generated value for several stakeholders inside the organisation affecting departments, employees and even other information systems. At the departmental level, the efficiency of the IT department is enhanced because of the reduced ad hoc queries submitted by employees. Thereby, the IT staff can allocate their resources on more strategic tasks. 'It has definitely reduced the ad hoc queries that we have to answer for rest of the organisations. So, it has freed up capacity for us to be more strategic' [Insight department]. At the individual level, users are impacted financially. By accessing their own data, employees of the sales department can explore data related to their sales activities and create analytics showing the amount of commission they receive each month. 'I used self-service to create reports showing how many sales I got and how much commission I get.' [Business user]. Furthermore, SSBI has influenced their performance on some tasks. By having the freedom to create personalised reports and accessing data freely, users get more autonomous in exploring and exploiting data to answer daily questions related to their work. 'Through the self-service I can build a report to see our users activities on our platform' [Business user]. The value of the self-service platform can also impact another self-service platform through the advanced employment of the data in creating analytics. Advanced users (such as the product development team) can test a hypothesis about user behaviour of a certain functionality built into an information system.

For instance, we have some hypothesis that if we just put a link to a page on the first page in a specific location then we can address more people and then after a certain amount of time I just go into self-service and see if we are getting more people to look at the link by applying this change. [Business user]

## Discussion

To minimise the risk of low-quality decisions, this study shows that one should focus on the quality of the SSBI service provided and the competencies needed to operate in a SSBI environment during co-production and co-creation. We have pointed out the different types of people involved with SSBI and through our findings we have highlighted the important elements that they should have to successfully build and operate the SSBI (see Table 1).

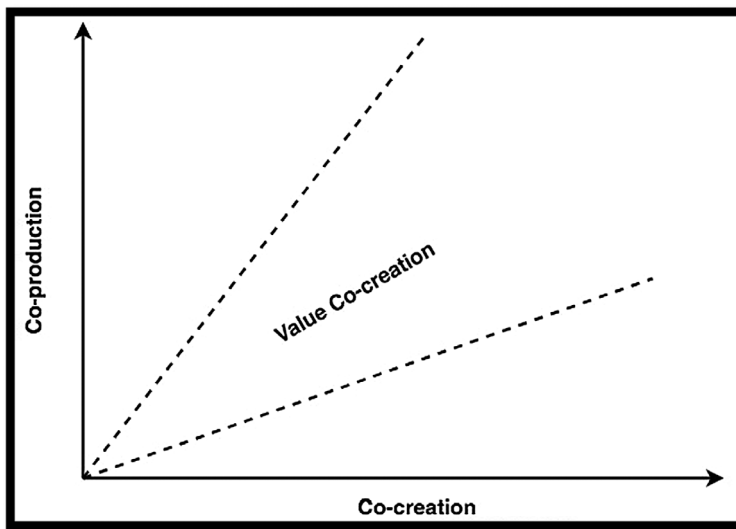
From a theoretical perspective, even though S-D logic has been adopted earlier in the IS literature (Lusch & Nambisan, 2015; Yan et al., 2010), to our knowledge, this adoption has so far been limited to studies of co-creational contexts between companies and their customers. In this current study, we provide an empirical account of applying the S-D logic lens in an intra-organisational context stressing the application of the logic in other actor-to-actor networks (Vargo & Lusch, 2017). Our findings support the fundamental notion that co-production is an important step in co-creation of value (Ranjan & Read, 2016) and the healthy interaction between both phases (co-production and co-creation) enable a healthy co-creation of value (see Figure 2). This is reasonable, as the involvement of business users at early stages of co-production will increase the chances of a beneficial proposed value. Given the



**Table 1.** Summary of findings.

Actors	Co-production		Co-creation	
	Resource Exchange	Value proposition	Resource Integration	Value in use
IT staff	Analytical skills, technical skills	Free-up time for IT staff, centralised data access to users, less ad hoc requests	Technical knowledge, support, analytics validation, data model update	Focus on advanced analytical tasks, self-efficiency of routine requests, prevent abusing the data warehouse
User	Business knowledge, business experience	Autonomy, freedom for exploration, responsiveness, data access	Business knowledge, time, technical skills (low-high), analytical skills, motivation, understanding the firm business model	Data source connection, analytics creation, Effectiveness in customer response, efficiency in task performance, personal gain
SSBI environment	Ability to connect to different data sources, data loading and consistency	Platform for insight discovery	Integrated data model, standard dashboards, data source access, data export, insight sharing	Data model improvement, increase adoption





**Figure 2.** Relation between co-production and co-creation.

service nature of an SSBI environment to provide actionable and operational information needed during daily work, users have to be involved during the design and implementation of data models. This study shows that operant resources are present during the phases of co-production and co-creation. From a firm-customer perspective, the operant resources could be the business employees (the firm resource) or the customer (service beneficiary). However, in a SSBI the operant resource is the service beneficiary and without this configuration the service could have no value, hence no usage. S-D logic argues that co-creation starts when actors engage with the value proposed and co-production is a component of co-creation, which can vary from a total absence to a full engagement (Hilton et al., 2013). This is in contrary to SSBI where co-production is a necessary phase before co-creation happens. This study indicates several implications for organisations. First, companies should invest in a collaborative environment where business users and IT staff/business analysts/data scientists may come together during the co-production phase. Second, companies should invest on necessary trainings that business users might need to feel competent in working in an SSBI environment with analytical tools and reporting applications. Third, companies should assess the value proposed during co-production if that is aligned to the company's objectives that acts as an input during value co-creation.

## Conclusion

We have explored through this paper the co-creation of value through the co-production between the users of SSBI and the IT staff by understanding the nature of the process that is taking place when engaging in the SSBI. Reconnecting with the aim of our paper, we have described how SSBI service is built through the essential collaboration between the IT/BI staff and the business users involved. In SSBI co-production is an important step in enabling a healthy co-creation and cannot be underestimated. This study also has pinpointed to the most important elements that influence building the SSBI service as well as its usage by

employees. Based on this research study and empirical account, we have developed an empirically grounded understanding and description of the role of co-production and co-creation in building SSBI service. Future studies may explore the co-creation phase to understand in more detail how users co-create the value and what are the basic skills needed. Due to the fact that not all users possess similar knowledge, skills and motivation to engage in insight discovery and co-creating value, it is important to understand whether there are different modes of engagement that exist and what controls them.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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