Business Roles in Creating Value from Data in Collaborative Networks

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Abstract. The present study investigates activities and actors' roles in how companies utilise and adopt big data and cognitive systems in their business processes. Based on the literature review, a qualitative analysis of 18 in-depth interviews with participants from six companies and a complementary review of five illustrative case companies, we identify five different roles to create business value or new business opportunities in the collaborative networks. Based on those business roles, we also identified activities and outcomes. This study contributes to the debate regarding business roles and activities and how companies create value in adopting data and cognitive systems in collaborative networks. For practitioners, the findings show that different data-driven business roles and opportunities exist in the collaborative networks. The business roles are not exclusive, and the same company can have several roles depending on the business case.

Keywords: big data, business roles, cognitive systems, collaborative networks, value creation

1 Introduction

Data, a valuable form of capital, may enable new businesses and promote value creation for companies [1,2,3]. In collaborative networks, actors are interacting with each other for co-creating value, and they have different and supporting roles in value-creation processes. Thus, new ways to co-create value in collaborative networks create novel business opportunities for some companies to sell their data to other actors. Additionally, service providers could integrate others' data with their own to create analyses. Technology providers can develop new solutions to collect, manage and analyse data. All these examples point out that data may create new business opportunities. Managing data-driven businesses often requires inter-organizational collaboration where actors have a special role in data-centric value creation processes.

Data analytics is an essential activity in creating new knowledge in organizations. However, research on different value-creating roles in capturing business value from data analytics and cognitive systems from the viewpoint of collaborative networks is

scant. Moreover, most of the past research is rather conceptual or theoretical [4]. Thus, more research is needed to explain alternative roles of companies in creating new value by utilising data analytics and cognitive systems.

In solving the research gap, it is essential to focus on how data could create value for companies and their customers. New knowledge is more and more created in combination with human problem solving and cognitive computing. Today, it is a process where human needs and artificial intelligence are related. This study sought to investigate companies' activities and actors' roles in the utilisation and adoption of big data and cognitive systems in business processes. Through these roles, we studied how companies currently adopt data to create new value or business opportunities.

The paper is organised as follows. After this introduction, Section 2 reviews the essence of data, information, knowledge and business models. Section 3 describes the research method and data used in the study. After that, in Section 4, we present the five different business roles for creating new business through data utilization. The last section, Section 5 and 6, discuss the contribution of this study.

2 Knowledge-intensive Business and Business Models

The research of inter-organisational value creation shows that companies are more dependent than ever on the effective knowledge management as it forms basics for new knowledge creation in collaborative networks [5,6]. The cognitively processed outcome of information called knowledge has become a critical resource in inter-organisational exchange. As suppliers and customers depend on each other's knowledge resources more than ever [7], collaborative knowledge creation has become a critical competitive success factor for companies across industries. The increased need to promote new understanding through data analytics and knowledge management creates new business opportunities for several actors in collaborative networks [8].

In the following, we review the interrelationship of data, information and knowledge (Table 1). For understanding data-driven business models and business value in general, we need to understand the role of knowledge. Knowledge is a critical resource when companies extract business value from data in managing business practices and processes. It is also the refined mode of information needed in making complex decisions and in solving ill-defined problems. In fact, companies have always been dependent on knowledge that is a cognitively construed factual or procedural outcome that is created either by humans or cognitive systems [9].

Data represents a lower-level component from the business value perspective than does information and knowledge [10,11]. For example, the Merriam-Webster and Cambridge dictionaries connect data to facts or information that can be easily delivered and managed by humans and computers. Data is the core component of information; it consists of bytes, numbers and symbols that humans or computers can re-structure or logically order the form of information. Unlike raw data, information can deliver meanings and messages. Information forms basics for knowledge that requires cognitive processing, unlike data and information. Although there is no consensus concerning the definition of information and knowledge, [12] they are strongly associated with reasoning, problem-solving and decision-making. For example,

predictive analytics and its recommendations assist marketing managers in timing their marketing campaigns to the most productive moments. Thus, cognitive systems can create new knowledge that helps companies make better decisions, solve problems and optimise processes. Data refined digitally to the mode of useful knowledge helps to develop and perform various practices and processes in organizations and ecosystems. This added value is essential as the level of business value directly relates to the meaningfulness and usefulness of knowledge.

For understanding how knowledge is managed in business processes, organizations and ecosystems, we adopt the knowledge management literature in classifying the levels of knowledge processes. In Carlile's [13,14] knowledge management framework, knowledge is managed through sharing, interpreting and transforming knowledge. At the knowledge sharing level, existing knowledge is delivered across organizational boundaries. The category of knowledge interpretation adopts and modifies knowledge to the new context, and the category of knowledge transformation creates new knowledge and understanding.

In this study, the term business model describes how a company has organized its processes and businesses for creating business value for its customers or other stakeholders. Conversely, the business role of a company has a wider perspective in to the collaborative network and its influences. The business role better illustrates the actual role of an actor as a part of the collaborative network. It also shows the actors' positions in co-creating value through interorganizational interaction, where resource integration and value exchange represent the modern service-oriented approach to co-create value between actors. The actors are either resource suppliers, customers or customer's customers.

Although the research on data-driven business models and roles is scant, some research papers have covered data-driven business models. Schroeder [16] reviewed big data business models and classified business models in three main categories: data users, data suppliers and data facilitators. Data users are using data in decision making or integrating it into the products. Data suppliers are primarily selling data, and in the data infrastructure business model companies provide data-related infrastructure, consultancy or analytic services. Schroeder notes that there are dependencies between different business models. Janssen and Zuiderwijk [17] focused on infomediary business models in the data-driven business and recognized six sub-categories of solutions: single-purpose apps, interactive apps, information aggregators, comparison models, open data repositories, and service platforms. Thomas and Leiponen [18] classified big data business models in a literature review. As a result of the literature review, they recognized the following business models: data supplier, data manager, data custodian, data aggregator, application developer and service provider.

Unlike the studies above, our study recognises and reviews business roles from the business value perspective, i.e. how companies can create new business through utilising data. We emphasise both value for the company and value for customers, as it demonstrates interorganizational collaboration and business models taking place in collaborative networks. Value creation happens through resource integration processes where actors in different companies unite their resources and exchange value depending on their positions in the value chain [19]. Thus, the business value perspective provides

a more comprehensive approach to analyse business roles as part of collaborative networks.

Table 1. Definitions of key concepts used in this study.

Key concept	Definition used in this study
Knowledge	Factual or procedural outcome of cognitively processed information. Its essence is often personal, contextual and situational "justified true belief" [12,15]. Knowledge is the essential resource for managing, developing and evaluating business and technology practices and processes. Examples of knowledge are rules, methods, conclusions, diagnostics, advice, reviews, recommendations.
Business model	The way in which company organizes its processes and businesses for creating business value in networks and ecosystems. Previous studies found the following data-related business models: data user, data supplier, data facilitator, data custodian, infomediary business, service provider, application provider [16,17,18]
Business role	The actual data utilisation related value-creating roles of actors and their positions in interorganizational interaction, where resource integration and value exchange take place.
Data	Data, either small or big data, is the core component in creating new information and knowledge. It represents a concept lower than information and knowledge [10,11]. Data provides value for business as "raw data", and it works as a building block in generating new knowledge. Examples of data are bytes, numbers or symbols that are easy to manage by cognitive systems and humans.
Information	A structured form of data. It can be seen as a thing, process or personal information [15]. Information provides value for business in delivering facts from objects or phenomena. Examples of information are statistics, Excel sheets, memos, writings, lists, figures, tables.

3 Methods

This study aimed to collect qualitative data from companies who are adopting data analytics in their business development, product development or new business creation.

The research approach this study uses is the case study, [20] as the aim was to develop a new understanding of the ways companies are adopting data in creating new business. We extended our research approach to the abductive qualitative research method, [21] as our goal is to build a new model that assists companies in identifying business opportunities and positioning themselves and their value-creating role in collaborative networks. The abductive research method enabled the researchers to build explanations and elaborate the conceptual model for combining literature review and empirical findings. Hence, the researchers simultaneously processed the prior literature and theories and the analysis of data gathered through empirical research and development work [21]. Using the iterative research process allowed for developing a

deeper understanding of the empirical data being analysed while simultaneously contributing to the theory of new business creation in the realm of cognitive systems.

We collected data from in-depth interviews with company representatives and reviewing illustrative case examples. The interview data was collected during 2017 from 18 semi-structured theme interviews from six companies in the healthcare, manufacturing, staffing and data processing industries (Table 2). The case companies were in different development phases in terms of their experience in big data utilisation, and also in terms of their business models and new business creation.

Table 2. Interviews and interview data

Case company	Industry	Size	Experience in big data utilisation	Number of interviewees
A	Healthcare	large	experienced	5
B	Staffing	large	experienced	2
C	Manufacturing	medium-sized	beginner	2
D	Manufacturing	large	beginner	6
E	Data processing	start-up	advanced	2
F	Data processing	large	advanced	1

The interviews were audiotaped and transcribed to enable a qualitative content analysis. In the interview analysis, we applied codes with predefined coding categories, as our literature review formed our understanding of the levels of information processing and potential value in adopting data analytics in companies [22]. In addition to the interview data, the material from the additional illustrative cases was reviewed from the perspective of business roles and how they utilise big data analytics in their business. Thus, we used five illustrative cases to show examples how companies adopt the role in their business. We analysed data from web pages, articles, presentations, annual reports and marketing material.

4 Results

Based on our research findings, we identified five different business roles to show how companies are adopting data in creating new business opportunities. These roles relate to the provision enabling technologies for creating software and infrastructure business (technology provider), enriched data for creating new revenue (data refinery), analytics for creating new professional services (business analyst), data-driven applications for creating new service business (service provider) and value-added services for enhancing customer experience and purchase behavior (value catalyst). In the following, the five different business roles are described in more detail, and summarised in Table 3.

Table 3. Actor roles, value creating activities and business value for customers

Actor's role	Value creating activity (actor's perspective)	Business value for customers
Technology provider	Enabling technologies for creating software and infrastructure businesses	Cognitive systems, analytic software and hardware solutions
Data refinery	Providing enriched data for creating new service businesses	Richer and qualified analytics
Business analyst	Supplying analytics for creating new professional services	Business insights
Service provider	Providing data-driven applications for creating new service business	Process improvements
Value catalyst	Delivering value-added services to enhance customer experiences and purchase behaviours	Enhanced customer experiences

Provision of enabling technologies for creating software and infrastructure business (technology provider) is the first identified role. In this role, companies design, produce and sell technological solutions to other companies. The following excerpt from interviews shows that the business model is built on technological competencies. *"…Sometimes we program almost on the hardware level, sometimes we can use standard SQL- and no-SQL-tools. Our development tool is programming language…"* (Founder of a software start-up). The excerpt shows how their role is technology provider in the ecosystem of cognitive systems. In addition to software solutions, these companies can also create value by enabling the collection of sensory data as part of physical artefacts. They create value for their own customers by providing, e.g., software products with advanced algorithms or IoT-type solutions. According to their value proposition, technology providers deliver technological software and devices that make it possible to collect, analyse and manage data. This business model is related to the Internet-of-Things (IoT) phenomena where IP-based sensors are connected to the conventional things. It enables service providers to collect usage data and remotely control and monitor physical devices or things. From a collaborative network perspective, technology providers need customers and service providers who embrace their software and infrastructure solutions.

Providing enriched data for creating new service business (data refinery) is the second identified role. The companies can sell datasets to other companies, who can combine it to their own datasets. They collect data, for example, from their own customer databases or production or delivery processes, but they do not only use it by themselves, but they also want to sell it to actors in their own ecosystem. Thus, they create value for other companies providing data for analysing processes. This business model focuses on the selling of data or data-focused services. A staffing company interviewee stated the following: "*We want to process the data and enrich it and offer it in different kinds of packages to different kinds of services. And we want to challenge our customer business fields to use their imagination about how we should package these big amounts of data that we now have so that companies are willing to pay for it.*

Either so that they collaborate with us and the data gives us competitive advantage, or that we will offer a new service in which our and our customers' data is used." (Director of a staffing company)

This excerpt shows how companies can extract more value from conventional services by collecting data from their processes. For example, one media company in Finland has taken the courageous step of commercialising its anonymous customer data by offering data-refinery services [23]. The company's Finnish name, Rikastamo, broadcasts its value proposition, as this word means 'enricher' – a service that can help firms' enrich their own data by analysing and visualising them. Data refineries thus use technology providers' solutions and collaborate with business analysts and service providers who are typically their partners and customers.

Providing analytics for creating new professional services (business analyst) is the third identified role. In the third business role, companies can analyse their own or third party data for creating business insight. Thus, their value proposition promises new business insight that they sell to the actors. The following excerpt points out that companies use their own data in creating new services: *"…we are turning our operative model toward such [model] that we do not offer datasets, but we offer business insight based on those datasets, and then added-value increases"* (Director of a healthcare company).

The present excerpt reveals that service providers can begin to offer business analyst services instead of delivering only 'raw' data. Often these companies are categorised as professional service providers or business analysts, especially since industry expertise is needed to create business insights from datasets. Companies with large daily or monthly customer volumes collect client data as part of these firms' operative processes. Technology providers' advanced cognitive systems have even made data collection automatic, but companies need to deal with privacy and security issues so that they can utilise their data for commercial purposes. To this end, firms typically make use of data refineries and technology providers' services.

Providing data-driven applications for creating new service business (service provider) is the fourth identified role. The companies design services, either IoT applications or purely digital applications, that create value by advising customers in some special context. They collect and utilize data in creating real-time analyses that form basics for advises. Examples of this category are recommendation systems used in e-commerce and intelligent advisory systems used in industrial processes. In this role, service providers design and develop applications that utilize, e.g., a large amount of historical search and purchase history, identify the use segment, and then recommend products and services that best match the identified user profile in this user segment. The companies have also developed digital services where they combine their own data with customers' datasets and provide business insight to improve customers' operative processes, which is illuminated in the following comment by a staffing company representative: *"What we do is that we have built, for example, technologies with which we are able to handle data and offer it to customers in a form which they are interested in and which they see beneficial. Them giving us data creates added value. We work with it, add our own data into it and then package it to be used together, and so it brings*

us both added value and improves collaboration, management and decision-making". (Director of a staffing company)

For example, the Internet of Things (IoT) has been applied by a welding company that offers its customers traceability through data systems. Welding machine manufacturer Kemppi Ltd. provides software modules that offer detailed data on everyone involved in welding processes [24]. From a collaborative network perspective, service providers thus work with technology and other service providers who participate in value co-creation by providing new services. Business analysts and data refineries may also offer other services that create business insights into how to improve processes.

Providing value-added services for enhancing customer experience and purchase behaviour (value catalyst) is the fifth identified role. Companies can also create value by sharing information as free to their customers. This role belongs to the category of loyalty programs, and its ultimate goal is to enhance customers' experience while they consume the companies' products and services. An interviewee from a manufacturing company describes the company's free data sharing as follows: *"We have analysed news feeds, and recognised trends such as where we are going, what is happening beneath, and this is something that customers see as a remarkable added value… And this gives an impression to customers that this is something that we manage... So, analysing and data and trying to think how you can serve customers with it, that alone can add competitiveness."* (Director of a manufacturing company)

This example shows that delivering data-related value-added services to customers can enhance customer experiences. The information concerning value-added services does not belong to the core product or service, but is, however, related to the process where consuming products or services takes place. From the business viewpoint, it enhances the customer experience by providing useful situational data. The data is collected from customers' usage processes. Thus, it does belong to the category of "reverse use of customer data". In their study, Saarijärvi, Grönroos and Kuusela [25] show how several companies collect data from their customers; they return part of it as refined information, such as recipes based on food purchase history or household consumption history of electricity. This is known as "reverse use of customer data". The following excerpt shows how companies have also recognized the potential to improve customer experience by sharing information with customers: *"..it would be nice if we also could provide that, how would I say it in Finnish, solutions for customer experience and customer driven utilizing data …we have issues that could be shared between customers as they have similar challenges…"* (Manager of a manufacturing company).

Companies can also share data freely on the public Internet. For example, KONE, a leading elevator manufacturer, has launched a public service where one can listen to how elevators "talk" to each other in their cloud centre. The public service illustrates how the elevators send sensory data to the cloud system, and how it returns data to the elevator that is connected to the cloud service [26]. Co-creating these services to enhance clients' experiences and purchase behaviours requires collaboration with other service providers, such as technology providers.

5 Discussion

Although the existing literature on data-driven business models [16,17,18] provides initial clues to valid categorisations, research on business roles and value-creating activities is still scant. Unlike previous research, the present study examined companies' roles in terms of business value and new business creation through data utilisation. These two perspectives provide a comprehensive approach to analysing companies' roles as part of collaborative networks. The present study's results contribute to filling the above-mentioned research gap by providing new findings on firms' roles in creating value from data-driven businesses. This research focused especially on actors' positions in interorganisational interactions in which resource integration and value exchange take place. Thus, our study contributes significantly to the on-going debate about data-driven businesses in collaborative networks [6,8].

Based on empirical analyses, we identified five roles and value-creating activities concentrating on how to create value for customers. In addition, these roles collaborate with other roles depending on the business model applied. Each role has, therefore, its unique value-creating activities supported by other roles' activities. Companies can combine their datasets with other firms to produce richer analytics. The former companies can also analyse and visualise data to make them easier to share, facilitating service provider experts' adoption of data-based tools. In addition, these companies can also integrate resources to create new business insights. In this process, data analysts' results are integrated with the findings of service providers' industry experts, and new insights are generated. Value catalysts can create new value-added services by applying analytics and software solutions' results to existing digital or physical services. Some examples that fall into this category are IoT applications or mobile services that utilise external data sources.

Companies seldom create value alone in data-driven businesses. In these collaborative networks, actors integrate resources and exchange value based on these actors' business roles within networks. Firms collaborate to collect and manage data, analyse results, interpret findings and generate new knowledge. As a result, activities' potential value and cognitive systems' complexity naturally vary in business models. This is in line with the results of Carlile's [13,14] research, which examined how actors engage in value sharing, as well as interpreting and transforming knowledge. Thus, companies are able to not only sell datasets but also help each other interpret data streams and analyse or create new business insights and recommendations.

These activities and business roles are not exclusive, and the same company can have several roles in the surrounding business ecosystem. In some cases, firms only sell 'raw data' to their partners. In other cases, these companies conduct analyses that produce business insights or license their algorithms to partners.

6 Conclusion

This study's results provide new insights into firms' roles and value-creating activities in data-driven business sectors. We identified five roles actors can play, each of which has value-creating activities that integrate with each other in collaborative networks.

The findings highlight that conventional service companies are also developing data-driven services. They are thus entering into new business ecosystems through roles that are new for these firms. The results show that companies seldom work alone when managing data and that value creation happens in networks in which firms have their own specialised role in integrating resources. These roles are not company specific although some companies specialise in specialised value-creating activities, such as software or consultancy. The findings reveal that large companies, especially, can play several different roles within corporations, so different business units may collaborate with each other to create new value for customers.

This study shows that practically any company can enlarge its business to include data management activities and become an actor in data-driven networks. However, firms must first identify processes in which data are created and managed. In addition, companies need to understand their business's position and opportunities in collaborative networks, as firms cannot suddenly start competing with their current loyal partners or customers. The present study's findings can, therefore, help practitioners identify new business opportunities that no one in their companies has recognised previously.

This study's most basic limitation is its reliance on a quite small number of interviews and company cases, which limits the results' transferability. Nonetheless, the findings provide a basic understanding of data-driven businesses' roles and value-creating activities. The present research raised questions concerning co-creation of network-based value propositions, which merit further examination. This study's results should also encourage researchers to explore empirically companies' value-creating activities in collaborative networks.

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