The role of trade associations in the digital transformation of their industry

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Received 5 November 2022
Revised 14 December 2022
14 January 2023
Accepted 15 January 2023

Abstract

Purpose – This paper aims that digital transformation (DT) is crucial for companies to stay competitive. While research on DT has quickly gained great popularity, the intersection of trade associations (TAs) and their role in the DT of their members is not yet researched.

Design/methodology/approach – In this paper, the authors conducted 20 interviews with Belgian TAs to investigate the role of a TAs in the DT of its members, and how they drive the DT of its members. In addition, the authors investigate the core tasks of TAs, the need of the different industries to digitalize, and the digital projects the different industries are working on.

Findings – The findings indicate that TAs can be in a prime position to steer the DT of their members, especially for industries comprised of smaller players. Their roles can range from informing roles to true leaders of DT by creating novel products, such as online platforms and driving the entire sector forwards.

Research limitations/implications – These findings call for more research into TAs and how their role can be optimized for steering DT of their members.

Originality/value – This is the first study to extensively study the role of TAs on the DT of their members.

Keywords Digital transformation, Trade associations, Federations, Professional associations

Paper type Research paper

Introduction

Digital transformation (DT) encompasses the changes taking place in business and society through the use of digital technologies (Vial, 2019). These developments have led to considerable changes in business and society (Kraus *et al.*, 2022). The increased possibilities of digital technologies can be used to improve the efficiency of many operations, products and services. Often, entire product lines or business models can be reinvented. This process is steered by increased competition, customer demands and cost-efficiency aspirations. More than 80% of companies are aware of the necessity of DT for their survival (SAP Center for Business Insight, 2017). This importance is also reflected in the academic research that has grown exponentially since 2010 with more than 1,000 papers published in the year 2020 (Van Veldhoven, Etikala, Goossens, & Vanthienen, 2021).

Many companies face great difficulty when embarking on DT. Typical challenges include lack of strategy (Schneider & Kokshagina, 2021), lack of leadership (Brock & von Wangenheim, 2019), resistance (Diener & Špaček, 2021), lack of urgency (Hafsi & Assar, 2016), lack of knowledge (Schneider & Kokshagina, 2021), lack of resources (Cichosz, Wallenburg, & Knemeyer, 2020) and lack of skills (Cichosz *et al.*, 2020). While many researchers are investigating the DT at large companies to propose guidelines and frameworks to deal with these challenges, little research has been conducted in the role of a

Digital Transformation and Society
Vol. 2 No. 3, 2023
pp. 235-256
Emerald Publishing Limited
e-ISSN: 2755-077X
p-ISSN: 2755-0761
DOI 10.1108/DTS-11-2022-0058

trade association (TA) on the DT of their members as shown in section two. TAs represent, help and protect their sector, labor or members by pooling their members' resources. Many challenges that companies face during DT, such as lack of leadership, knowledge and resources, can be partly mediated by an overarching TA. They can take the leading role for the DT and pool the resources of their members to invest in skills, knowledge and industry-wide digital products. They can also create training courses for their members, lobby for better regulations or subsidies, and help their members with their digitalization goals. Hence, TAs seem well positioned to steer their sectors' DT.

However, the potential role of TAs in face of industry wide disruption due to DT is not well understood. In addition, it is unclear whether TAs can significantly drive their industry members DT forward. Therefore, qualitative interviews were conducted among 20 Belgian TAs to provide an initial answer to the following research questions.

(1) What roles do TAs play to support their members DT?

(2) How are TAs driving the DT of its members?

We continue the paper with some more background on DT frameworks and a systematic literature review to review what has been researched on the intersection between DT and TAs. Next, we explain our methodology including the selection and search criteria of TAs for the interview invitations and our questionnaire in more detail. The results are then given in section four. We finish the paper with a discussion of our results, how they impact DT research and practice, and suggestions for future work. We conclude the paper in section six.

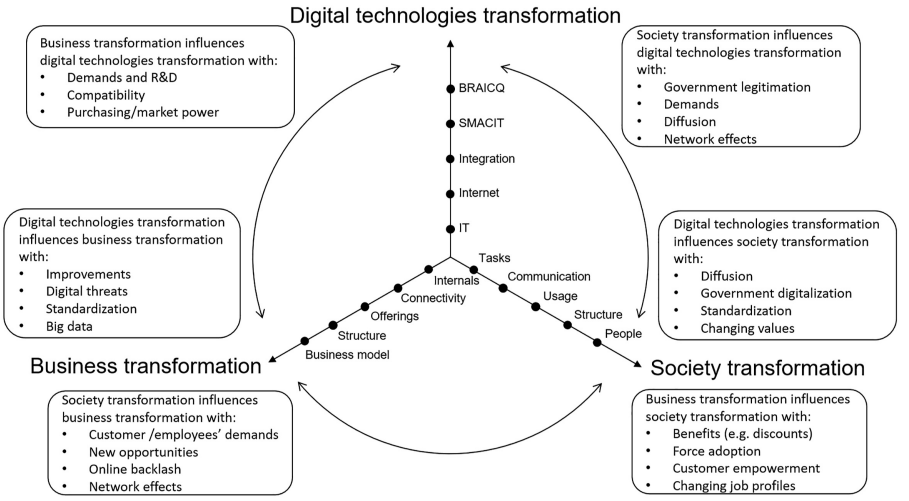
Theoretical background

Digital transformation frameworks

There exist many definitions and frameworks of DT, with new ones coming out every year, each with their own focus and characteristics such as a focus on digital maturity (Valdez-De-Leon, 2016), on organizational capabilities (Konopik, Jahn, Schuster, Hoβbach, & Pflaum, 2022), on the transformation process (Vial, 2019) or on academic entrepreneurship (Garcez, Silva, & Franco, 2022). In this paper, however, we utilize the interaction-based DT framework as a research lens for the second research question (Van Veldhoven & Vanthienen, 2021). This framework was chosen as it expands upon the DT drivers mentioned in previous frameworks. In total, the framework sketches 23 drivers of DT between three axes (business, society and digital technologies), with each axis including their respective major changes or transformation over time. For instance, the drivers of how businesses influence society to digitalize are located on the arrow from business to society. One of these drivers, for instance, is benefits, meaning that businesses offer benefits with their digital products or services to customers in the form of convenience or discounts who thereafter are more inclined to use the digital services of the businesses, and express those customer demands to other businesses as well (Van Veldhoven & Vanthienen, 2021). According to this framework, adapted and shown in Figure 1, it can be stated that a TA drives DT if they influence the drivers of this framework.

Trade associations

TAs, also referred to as federations, trade unions, professional associations, professional societies or professional organizations, are organizations that operate within a single industry, profession or type of firm. They are often founded by several members of the industry to pool their knowledge, resources and capabilities to aid the entire sector with certain activities or to influence regulations and other stakeholders (Holley & Shearing, 2014). Industry members can pay membership to the TA to enjoy their services and products.



Source(s): Adapted from Van Veldhoven & Vanthienen (2021)

Figure 1.
The interaction-driven perspective on digital transformation

In other cases, membership is mandatory by law, or the TA is completely subsidized by the government and the entire sector enjoys its services free of charge. Essentially, by pooling their resources and creating one front-facing speaker organ, the views of their sector are better heard on key topics that affect them such as political or economic issues (Barnett, 2013). The key role, therefore, is making sure that their members can thrive (Tsui-Auch, 2004).

Trade associations and digital transformation

To investigate what has been researched so far on the impact of TAs on the DT of their members, a systematic literature review was conducted. A query on Scopus was performed in search of papers dealing with both DT digitalization and TAs. We also included the often-used DT synonym digitalization, as well as several synonyms for TAs including professional association, professional organization, professional society or societies, federation or trade union. When including federation in the search term, the query returns over 690 papers compared to 60 papers without the term federation. A closer inspection revealed that most papers in the broader query were included due to the inclusion of the "Russian federation" in the abstract which is irrelevant for this paper. Hence, it was opted to keep federation in the search terms but to exclude the term "Russian federation" from the search query. The final query, as shown below, returned 110 documents in March 2022.

(1) TITLE-ABS-KEY (("digital transformation" OR "digitali*ation") AND ("professional association*" OR "professional organi*ation*" OR "professional society" OR "professional societies" OR "trade organi*ation*" OR "federation*" AND NOT "russian federation" OR "trade union"))

We analyzed the title and abstract of all the 110 papers. We had to exclude the majority of the papers due to them being irrelevant to the study, i.e. not being related to TAs in the sense of this paper, or because they were wrongfully included as the word federation occurred in the title of the conference or journal outlet. Only sixteen papers discussed or touched upon the intersection of TAs and DT as discussed below.

Only a few papers mention the importance of TAs for, i.e. redefining the business model (Mues *et al.*, 2021), providing high-quality information to their customers (Spiegel, Weiss, Stoycheva, Canis, & Ihler, 2021) or collaborating between the government, industry and academia (Fitnawan *et al.*, 2021). Other research has looked at TAs as suitable players in developing training and mentoring schemes that can help mitigate skill gaps in the job market such as the high demand for qualified chief information officers (CIOs) (Barnes, Rutter, La Paz, & Scornavacca, 2021) or the digital skills training of supply chain workers (Foroughi, 2020). Fiehn *et al.* (2020) found that the professional association of German rheumatologists is a key stakeholder in ensuring optimal care for all patients through appropriate delegation of medical duties and treatments. Another finding is that TAs hold the responsibility to raise awareness related to key issues in their sector such as occupational health in construction (Smallwood, Allen, & Deacon, 2020). In a similar fashion, Auberson (2020) investigated the responsibility of the European federation for medicinal chemistry to facilitate and raise awareness about the use of digital technologies. The federation is also suitable to increase interaction amongst scientists with scientific events and to influence European policy beyond what national organizations could achieve. Finally, some authors mention that TAs are a great actor for providing high-quality information about the sector that can be used for research as seen in the banking sector in Sghari (2019) and the manufacturing sector in Bärring, Johansson, and Shao (2020). These papers indicate that TAs are sometimes touched upon by research but they are not the key focus and little research has been conducted about them.

On the intersection of DT, TAs and its members, very little research has been conducted. Bauer and Brown (2001) claim that dental associations are in the best position to lead the DT of dentists. Similarly, Kuo, Chen, and Yang (2021) argue that TAs are essential in the maritime shipping industry. They can keep up with the DT trends and guide their members with recommendations that can be followed to steer the industry forward. In the German literature, Ickrath (2018) investigated the German diabetes society and its digitalization task force. The society was found to be a key player in the process of digitalization by defining seven action points and formulating practical guidelines on how to reach those goals: data privacy, data security, interoperability, standards for digital treatments of patients, treatment through communication, training, algorithms and transparency. Another interesting finding was that the society steered customer demands for DT by providing customers unrestricted access to quality information. By doing so, patients asked doctors about new products, technologies and types of care, which in turn steered doctors to have digital training. Finally, the authors mention the importance of collaboration between different stakeholders, i.e. diagnostics, pharma, tech and politics, and how the professional society is most suited to lead these discussions. Regarding the digital skills gap in nurses, Hovenga, Sinnott, and Gogler (2018) found that professional nursing organizations aid in solving these skill gaps by forming practical guidebooks, standards for information literacy and promoting technological training to meet these standards. In China, the professional organization of real estate played a crucial role in the development of the industrial information management system (Qing, Yao, & Ming, 2010). In this system, the massive accumulation of real estate data is digitalized. It includes among others appraises registrations, appraisal credits, agent registrations and examination systems. In a similar vein, the federation of the Finish taxi industry successfully defended its members against the rise of ride-sharing apps by creating their own platform app in which the traditional taxis were digitally linked to customers (Lanamäki, Väyrynen, Laari-Salmela, & Kinnula, 2020). This handful of papers showcases the potential impact TAs can have on their members. However, more research is needed to better understand their role in the DT of their members. These insights contributed to the development of the research questions.

Methodology

To investigate the role of TAs in the DT of their members, a qualitative interview methodology was chosen. On the Belgian government website, a list of all 381 active TAs in Belgium was retrieved. For each TA, the mission statement and core tasks were examined on their respective website. To be included in the further analysis, the mission statement of core tasks must include the digitalization of their members. In addition, the TA must be sufficiently large (>50 members, or >10 companies) and in an industry that is dealing with DT. Many TAs fell out of scope due to their limited size, e.g. a TA with 3 members, or due to their irrelevance to DT, e.g. the TA of acupuncturists. The result of this filtering was a list of 85 TAs that were interesting for this case study.

Invitations for interviews were sent out to these 85 TAs by email in January 2022. One month later, a reminder email was sent to those who did not respond to the original email. Of the 85 invitations, 20 federations responded positively (response rate of 24%), 4 federations responded negatively stating that they had too little time for an interview or were not fit for the scope of the research and 61 TAs did not respond.

All the interviews were conducted online due to the COVID-19 restrictions and took about 75 minutes each. The interviews were usually conducted with the chair of the organization or the digital advisor(s). In most interviews, multiple people were present including one or more digital advisors and the chair of the organization. The interviews consisted of six main parts: (1) General introduction of the TA in terms of size, core tasks, organizational structure and members; (2) Investigating the need to embark on DT and the DT strategy; (3) The current or past DT projects in the TA and the sector; (4) The role of the TA in the past DT projects in the sector and whether the sector is satisfied with their role; (5) The future plans in the sector and the TA, the goal of the DT, and which opportunities and threats they see in the future; (6) How the TA influences the drivers as theorized in the interaction-based DT framework (Van Veldhoven & Vanthienen, 2021). For each part, open-ended questions were asked in a semi-structured way. An overview of the questions is included in appendix. All the interviews were transcribed manually and categorized per question. An overview of the interviewed TAs is shown in Table 1 below.

Results

We have interviewed a broad range of TAs, both in terms of characteristics as well as in types of sectors and members. In what follows, a summary of our findings from these 20 interviews is given. While the results are presented in a general manner, these findings are not necessarily generalizable to other TAs.

Descriptive analysis

All TAs are funded by memberships, and a small part also receives income from subsidies and selling products or services. In general, three types of TAs can be distinguished based on the members they represent.

(1) Professional: members are active in a particular job or industry

(2) Sector: members are active in a particular sector

(3) Umbrella: members are active across a broad market

In the professional type, we have interviewed the federation of orthopedics, Belgische Beroepsvereniging voor Orthopedische Technologieën (BBOT). Their members consist of four professions, namely orthotists, prosthetists, orthotist technicians and orthopedic surgeons and represent about 90% of the Belgian market. Most of their members are small firms; however, they also represent several large companies. Next, Boerenbond mostly represents small farmers

#	Name	Type	Employees	Sector	Members
1	Denuo	Sector	12	Waste and recycle	250
2	PensioPlus	Sector	40	Pension institutions	200
3	Bbot	Profession	4	Orthopedical technologies	180
4	VCB	Sector	19	Contractors	10,000
5	Boerenbond	Profession	200	Farmers	16,000
6	ITAA	Profession	50	Tax advisors and accountants	15,000
7	UDB	Sector	1	Dental technologies	110
8	NVKVV	Profession	5	Nurses	8,000
9	Bouwunie	Sector	23	Small contractors	7,000
10	2mpact	Umbrella	8	Federations	/
11	Verso-net	Umbrella	23	Social profit	/
12	Essencia	Umbrella	20	Chemical industry and life sciences	720
13	Medaxes	Sector	6	Generic drugs	14
14	TLV	Sector	13	Transport and logistics	1,500
15	Lextra-lingua	Profession	9	Translators and interpreters	240
16	Feweb	Sector	2	Internet applications	400
17	Voka	Umbrella	350	Every sector	18,000
18	Febelfin	Umbrella	48	Financial sector	225
19	Fednot	Profession	200	Notary	1,500
20	VVR	Profession	5	Travel agents	800

Table 1.
Overview of the interviewed TAs with their type, employees, sector and members

Note(s): For professional TAs, the members refer to individuals while for the sector and umbrella type, the members refer to the number of companies

and horticulturists, including greenhouse farmers. With 16,000 members, they represent around 70% of the total Belgian market. Institute for tax advisors and accountants (ITAA) is the federation for Belgian tax advisors and accountants. Every firm or individual that provides accounting services must be a member of ITAA by law. Hence, they represent 100% of the accounting market ranging from individuals to large companies such as Deloitte. For tax advisors, membership is voluntary but members have the added benefit of being recognized as certified tax advisors. The nationaal Verbond van Katholieke Verpleegkundigen en Vroedvrouwen (NVKVV) embodies 8,000 nurses or 25% of the Belgian market. These include all types of nurses ranging from hospital care to home care. Some hospitals include membership of the NVKVV in the employment benefits. We have also interviewed Lextra-lingua who represents 240 sworn translators and interpreters or about 8% of the total Belgian market. Next, Fednot is the professional association of Belgian notaries. They represent 1,500 notary firms. Moreover, we investigated the vereniging vlaamse reisbureaus (VVR) which represents the Belgian travel agents. These travel agents, either individuals or companies, sell travel plans or organize group travels. VVR has about 800 members or 80% of the market.

In the sector type, we have interviewed Denuo whose members are active in the waste and recycle industry. They represent more than 250 companies, including small firms, large firms and internationals, that work with certain materials in one or more chains of the recycling lifecycle. Next, PensioPlus represents 200 companies that are active in supplementary pension commitments by an economic group or public institution, for instance by companies that pay part of their employee wage to their supplementary pension plan. Regarding construction, we interviewed Vlaamse Confederatie Bouw (VCB) and Bouwunie. VCB has over 10,000 members, around 10% of the Belgian market, from every facet of construction including plumbers, painters, contractors and carpenters. They include both small and large, international players. Similarly, Bouwunie represents 7,000 construction companies but is focused on the small-and-medium players with less than 50 employees that are active in the following five areas: structural contractors, carpenters, installers, painters and ground-and-

road workers. The Unie dentaaltechnische bedrijven (UDB) represents 110 companies active in the dental technologies industry in Belgium. Their members create prostheses, implants, teeth crowns, mouth scanners, surgery accessories and so forth. In healthcare, we interviewed Medaxes. They represent 14 large companies active in the manufacturing, packing and distributing of generic drugs. Next, 1,500 transport companies are embodied by transport en logistiek Vlaanderen (TLV), 10% of the market, of which 75% are Small and medium enterprises (SMEs) with only a handful of trucks. Regarding internet application developers, Feweb bundles 400 companies, about 10% of the market, that specialize in website development, digital applications, e-commerce, digital services and digital marketing. Three-quarters of their members are small companies with less than 25 employees.

In the umbrella type, we have interviewed six federations. One special case is 2mpact, as their members are other federations. They aid them with a myriad of services such as communication aid, organization of training, customer relationship management (CRM), surveys and so forth. In the social profit industry, we contacted Verso-net. Their 15 members are also federations but all active in social profit industries such as healthcare, welfare, culture, environment and special needs. Social profit is defined as companies that reinvest all of their profits and have a social goal or commitment. It is a major part of the Belgian economy with a share of 40%. Next, any type of company can become a member of Voka. They support 18,000 companies from a broad range of sectors and characteristics ranging from startups to multinationals. For the financial sector, Febelfin was interviewed. Five different types of financial activities are represented across their 225 members including banking, credit, leasing, stock market and asset management. We also interviewed Essencia which represents 720 companies active in the chemical industry including plastics, pharma and biotech.

In terms of monetization, the majority of the income of the federations is from their membership fees. Hence, the financial resources and size of a federation are aligned with the number and size of its members. The membership fee can be a flat amount, which is more common in the professional type, or a variable amount based on the size of the company, which is more common in the sector and umbrella type. Several variations on membership fee structures exist such as fees based on the market share as is the case in Febelfin or based on the members' added value as is the case in Voka. In some cases, public funding, selling additional services and sponsorships are other shares of income.

The need for digital transformation

For each federation, we inquired about the need for DT of their members. The majority of professional associations claim that the pressure for their members to digitalize is substantial. This pressure comes from a variety of drivers.

The most important driver is cost efficiency, as also acknowledged by Voka. To stay competitive in an increasingly connected and digitalized world where profit margins are shrinking, being as cost-efficient as possible is essential. By way of illustration, PensioPlus is working with its stakeholders to reduce paper mail. In the dental technology industry, companies are trying to improve the efficiency of the information exchange between dentists, dental technology firms and health insurers through digitalization and automation as the current process is resource-intensive and prone to errors. In a similar vein, Medaxes's generic drug distributors work towards the automated handling of price changes as manually updating every drug price is labor-intensive and prone to errors with costly product callbacks as a result. For the construction and agricultural sector, cost-efficiency is crucial due to their low-profit margins. As a result, firms are increasingly looking for efficiency gains by utilizing novel technologies, and digitalizing orders and invoicing. In the chemical industry, Essencia claims its members look for digitalization opportunities not only to be more cost-efficient but also to reduce their ecological impact.

The second most mentioned driver is competition. To illustrate, the dental technology industry faces heavy competition from the large companies that have the capital to invest in automation and robotization thereby stealing customers and lowering the profit margins of smaller players. To stay competitive, digitalization is necessary for the small players. In the construction industry, we found evidence of contractors that invest in good websites, online ordering, digital marketing and online customer interactions, receive more jobs than those that do not. There is also a trend of increased competition for foreign countries across all sectors that can often produce at a lower cost than their Belgian competition. Finally, Febelfin mentions that the financial players receive competition from new fronts, for example, the big tech companies such as Apple and Google increasingly look towards financial services. Belgian financial players must stay alert and innovative or risk falling behind.

Related to the cost efficiency, is the driver of increased complexity. Pensioplus, for instance, mentions that their industry becomes more complex due to new regulations, more control mechanisms, internationalization and so forth. Without digitalization, this complexity would become surpassingly difficult to manage. In a similar situation are the farmers of Boerenbond, who deal with progressively more regulations, controls and transparency reports.

Another important driver for DT is the digitalization of government affairs. For instance, the Belgian government created a new database where all recycling and waste information must be uploaded. This required the members of Denuo to improve their information flows and integrate their enterprise resource planning (ERP) systems with the new database. Likewise, the government created a new database to hold all information about the pensions requiring the members of PensioPlus to digitalize their processes. In the accounting industry, there are more regulations requiring certain documents to be available online, such as financial statements, thus requiring accountants to digitalize such processes and products. Similarly, the tax authorities demand that Belgian banks digitalize their information flows otherwise it would be impossible for them to control so much data.

Embarking on DT can also be done to mitigate the problematic shortage of staff that exists in many sectors. On the one hand, companies are attempting to reduce the number of employees necessary by investing in digitalization and automation. This is especially true in social profit, where most of the bottleneck professions reside, or for tax advisors who are short-staffed. In other industries, innovative technologies are seen as a major opportunity to deal with skilled labor shortages as they allow for a higher throughput per laborer. Another reason companies embark on DT is to make themselves more attractive to potential employees as was mentioned in the interview with Medaxes.

The rise of innovative digital technologies can also be a driver for DT. The dental technologies industry is heavily investing in 3D mouth scanners and printers to keep their position in the market. For the notary industry, Fednot worries that blockchain and artificial intelligence (AI) could completely revolutionize their core business. Hence, Fednot and the notaries are working hard on the digitalization of their services and strengthening their position as trusted and expert notary services, while creating pilot projects with blockchain. These examples showcase that the existence of novel technologies can drive companies to invest in these technologies themselves.

Governments can also influence the DT by introducing new regulations. For instance, new control regulations for waste collection and recycling are too resource-intensive to sustain. As a result, many firms are attempting to automate these controls with smart cameras. New regulations can also allow new competitions fronts. The Belgian notary industry is a protected monopoly, but new law proposals could soon open the activities to other parties and allow for price competition. As a result, Fednot has embarked on a massive DT project to increase the digital maturity of the Belgian notary industry. Another example can be found in nursing, where new quality laws dictate mandatory digital training courses.

The final major driver is customer demands. This played a large role in the digitalization of pensions where citizens demanded to know more about their pensions. In dental care, customers want to be aided as efficiently and effortlessly as possible. Hence, novel technologies such as 3D printed dental crowns quickly gain success. In construction, customers prefer to see real estate first virtually before booking a physical appointment, fueling the use of 3D scans and virtual reality (VR). Finally, several companies prefer working with logistic firms that can connect their transport information to their ERP systems.

Several smaller drivers influence DT too. First, some companies experience standardization pressure. For instance, as electronic transport documents gain a foothold in the European market, transport companies are required to follow or risk losing a large part of their customers. Secondly, not only customers but employees are also demanding to work in a digitally mature company. ITAA mentions that the tax advisors themselves find the physical process of typing, printing, mailing and scanning papers a cumbersome process and wish to see it digitalized. Thirdly, some contractors mention that a digital brand image can be seen as an important aspect to convince potential buyers. Fourthly, as more data is generated and stored, there is increased pressure to do something with that data. This was evident from our interview with Boerenbond who mention that new farmers' tractors are being equipped with sensors that produce data about their farmland and produce. As farmers indirectly pay for these services, it makes sense to start using them. Finally, there is interplay between the DT of the various stakeholders in the industry. When several stakeholders digitalize, the other players in the network must follow. For instance, when dentists rely on more digital tools to investigate dental problems, dental technology firms also must support these tools. An overview of these drivers is shown in Table 2.

To deal with these pressures to digitalize, only a small number of TAs created a dedicated digital strategy. Voka, for instance, brainstormed and researched the most important action points of DT by reviewing their members and found that the digital talent gap, knowledge scarcity, lack of digital mindset, integration with legacy systems, selecting the right tools, the financial burden, the need of external partners and the wrong business model are some of the

Main DT driver	Explanation
Cost efficiency	Profit margins are shrinking across industries. Digitalization is the key to improving cost efficiency
Competition	There is increased competition from competitors, international markets or unconventional players due to digital technologies
Increased complexity	Intensifying regulations, compulsory controls and internationalization create a great deal of complexity that is difficult to manage manually
Digitalization of government affairs	When public institutions are digitalizing, private companies that must interact with them, e.g. by uploading documents, must follow suit
Employee shortage	Many sectors experience problematic employee shortages. Digitalization is necessary to keep the same level of services with fewer employees
Innovative technologies	Innovative technologies can be a major threat if competition is the first to use them
New regulations	New regulations can make digitalization mandatory for certain processes or services
Customer demands	Customers demand increased transparency and digital access to their services and products
Standardization pressure	Digital standards in the industry require companies to follow suit
Employees' demands	Employees want to work in a digitally mature company
Digital brand image	A digital brand image can be an important factor to attract customers
Data generation	As more data is generated, companies experience pressure to take advantage of it

Table 2. Digital transformation drivers found in the interviewed TAs' industries

most vital challenges. They created a digital strategy that aims to solve these challenges, and as a result, additional employees in each regional office were appointed to guide their members with DT. Febelfin constructed an action plan to get all of its members on board with DT and to level the playing field. In addition, their strategy outlines safeguards so that all customers can continue using their financial services regardless of their digital skills such as the elderly. Fednot created a digital strategy to strengthen the notaries and involve them in more parts customer journey. They outlined three business model extensions including data centricity, collaboration with customers and stakeholders in ecosystems, and automation and AI expertise. Most federations include DT in one of their action points such as Bouwunie.

Trends and projects in the industries according to the interviewed TAs

Several digital trends can be observed by the interviewed TAs across their respective industries. First is the ongoing digitalization of paper-based administrative tasks and processes observed by almost all TAs. This is associated with a major push to reduce costs as much as possible. To give some examples, contractors, farmers, travel planners and financial players are all working on digitalizing their processes and incorporating ERP and CRM systems.

Secondly, many online platforms are being created for better information management and sharing between stakeholders. In pension institutions, novel databases and websites are being created to give citizens, governments and pension institutions more transparency and usability of pension data. In farming, the JustConnect project aims to become a data-sharing platform between farmers and third parties such as manufacturers of equipment and seeds to create customized products. In construction, building information modeling (BIM) is the next step in DT. It allows the integration of multi-disciplinary data with building plans to visualize its lifecycle and accelerate material ordering, construction and after-care. For instance, doors in the BIM plan are connected with actual objects that the manufacturer can deliver.

Thirdly, innovative technologies such as 3D printing, drones and robotics are being tested for a variety of applications. According to BBOT, manufacturers are increasingly using computed axial tomography (CAT) scans and 3D printing for creating prosthetics. Likewise, dentists rely more on mouth scanners and 3D printers to create aligners instead of braces. There is also the trend of using medical sensors to follow patients and e-health.

Fourthly, more sectors start experimenting with big data and AI according to their TAs. In the energy sector, there are projects with AI and digital twins to simulate new developments. In construction, large players start creating data lakes but the actual usage of data remains low. In farming, however, novel tractors are equipped with sensors that gather data about the farmland that allows for data mining applications to gain popularity: where to fertilize, water or plant. Data mining is also used for analyzing sales data, as in the generic drug market for example.

Another trend is the empowerment of customers. In construction, many manufacturers of building materials have started bypassing contractors by directly targeting customers with personalized building packages and do-it-yourself (DIY) instructions. For instance, customers can enter the dimensions of their floor and their choice of carpet tiles, after which a personalized building package is delivered to their house with all required materials and instructions. Similar trends, where customers are given the ability to do more things themselves, can be observed across many industries such as banking, pension institutions, low-code website builders and so forth. An overview is shown in Table 3.

Challenges in the industries according to the interviewed TAs

The interviewed TAs note that their respective industries face a list of challenges when embarking on DT. First, most TAs mention that limited resources to investigate or implement innovation projects are a main challenge in their industry. Both time and cost are major limiting factors, especially for SMEs such as farmers, contractors and social profit. Another key

Trends	Explanation
Digitalization of administrative tasks	A large effort is being done to digitalize administrative tasks, e.g. using ERP and CRM systems. This improves efficiency, as well as reduces costs
Online platforms for information sharing and management	Many industries face difficulties with sharing and managing information across all stakeholders. To aid with these problems, they invest in online platforms in which data and stakeholders can connect
Innovative technologies	Many innovative technologies are being evaluated in pilot projects such as 3D printing, drones and robotics
Big data and AI	More sectors are experimenting with big data and AI, especially in industries where sensor data is becoming embedded in machinery
Empowerment of customers	In many industries, customers are empowered to perform more services themselves. This is sometimes accompanied by removing intermediate players from the value chain

Table 3. Digital transformation trends mentioned by the TAs in their industries

challenge is that many companies are conservative and do not realize the benefits of changing. This is especially true amongst older employees or firms who are difficult to convince to change their way of working. In addition, many companies see DT as something either far away or not applicable to their industry. Others realize DT is a threat but do not perceive the opportunities. The next challenge is the lack of digital knowledge and skills in the industry. With the plethora of technologies and tools available in the market, it is hard to know for employees which tools are worth investigating for their situation. In addition, many employees do not have the digital skills to implement or use such technologies. Lextra-lingua mentions that translators have difficulties with basic things such as email and Excel. Regulations are another major barrier for innovation in many sectors. For web developers, the General Data Protection Regulation (GDPR) law is extremely limiting for creating web applications and gaining revenue streams from them. Another example is found in the transport industry where the rate of adoption of digital transport documents is notably low. The main reason is the government not accepting digital transport documents for transport across borders. Together, these challenges result in low adoption rates of digital products federations bring forward, which is in turn a vicious circle for low adoption rates as network effects are an important factor for the success of digital products and services. An overview of the mentioned challenges is shown in Table 4.

The core tasks of the trade association

Each TA was inquired about its core tasks. In general, it is possible to categorize their core tasks into nine aspects. There is no significant difference between the core tasks between the different types of associations.

Challenges	Explanation
Limited resources	DT projects are costly and time-intensive, which are major limiting factors especially for SMEs
Conservative	Many companies/employees are happy with the way things are and do not realize the benefits of change
Lack of knowledge	It is hard to know which DT projects or tools are worth investigating
Lack of skills	Many companies face a lack of digital skills to implement DT projects or tools
Regulations	Regulations can make DT projects complex, such as the GDPR law for online portals, or difficult to scale, such as the government requiring physical documents as well as digital documents

Table 4. Digital transformation challenges mentioned by the TAs in their industries

(1) Uniting: federations attempt to unite their members and establish a common interest together. Once defined, the federation's goal is to defend the common interest as well as it can.

(2) Representing: TAs represent their members and their common interest in government and supervising bodies. It is crucial to have a voice where the important decisions are made as changes in regulations can have a massive impact on industries. In addition, policymakers, politicians and labor unions can more easily discuss relevant matters with the federation than with every company in the sector. In addition, the TA can also be the media spokesperson by presenting the common opinion and demonstrating the internal industry expertise.

(3) Information and knowledge sharing: TAs keep up to date with the latest trends and best practices of the industry. They summarize and bundle relevant information, and distribute it to their members, government bodies, customers and media. This is usually done through newsletters, magazines or push messages via digital messaging applications as seen in TLV. In some cases, these newsletters rigorously describe technical aspects such as how their members can implement certain digital services. Moreover, they regularly organize info sessions to inform their members on trends, opportunities, threats and success stories. For instance, VCB holds successful info sessions on cybersecurity and the circular economy. TAs also hold regular networking events to facilitate networking, exchanging knowledge and establishing partnerships.

(4) Support: TAs often offer a variety of support services to their members. They give juridical, economic, environmental, innovation and technical advice. For instance, Medaxes offers technical support to correctly implement regulations, procedures and pricing options. This can be in the form of premade templates and guidebooks, or on an individual basis with personalized questions and answers, meetings or projects.

(5) Training: professional organizations create and offer courses to their members on a myriad of topics. In some cases, continuous education is mandatory for the members of the sector and the TA is qualified to offer these classes, as is the case in Febelfin. They are also qualified to hand out required certificates, for instance for internships. Moreover, Feweb collaborated with universities and business schools to offer educational programs in digital marketing to SMEs and their members. This indirectly benefits the entire sector, as educated clients are more likely to seek the services of the Feweb members. As a final example of training, TAs can protect the quality of their members' services by introducing certificates such as qualified tax advisors.

(6) Lobby: One of the core tasks of professional associations is to lobby for the benefit of their members. This can be in the form of reducing regulations or simplifying administrative obligations. To illustrate, Medaxes lobbies for digital package inserts in generic drugs instead of paper inserts that are mandatory. This would reduce costs with the added benefit of updateability. In addition, they successfully lobbied for shortening the timeframe between new generic drug launches and medical databases' updates from 6 months to daily, which has a major impact on generic drug sales at launch. Two other important aspects of lobby work are to push certain investments or to ask for subsidies. Another lobby example is to make certain educations more attractive to fix talent gaps that exist in the industry as found in Essencia. Lastly, in social profit, Verso-net is pushing for legal equality between social profit and profit sectors.

(7) Commercial: several TAs have commercial aspects as a part of their core activities such as selling services and products. For instance, TLV sells shipping documents to its members and provides taxation services.

In recent years, DT is slowly gaining a more prominent place among the core tasks of the TAs to aid with the digital challenges the industries face. First, most interviewees indicated that new training courses are created that deal with digital tools and cybersecurity. For instance, VCB has created popular courses on Microsoft Teams and cybersecurity while Lextra-lingua and VVR are helping its members with basic skills such as transforming scans into word documents and Microsoft Teams. Voka is creating programs on AI, cybersecurity and industry 4.0 that consist of several group sessions.

Secondly, there is a trend of sensitizing members that DT is beneficial and necessary. This can be done through a list of best practices, mapping all existing software partners and solutions, and giving advice on which problem to contact which partner. Verso-net, for instance, is trying to bring the digitalization speed of its pioneers to its smaller members by highlighting successful cases. Some TAs, such as Voka, do this by designing a DT roadmap together and guiding the members to reach their goals. This is necessary as there are many reluctant members in nearly all industries interviewed.

Several other action points are worth mentioning namely Boerenbond's active role in protecting farmers' data ownership against third parties such as equipment manufacturers. Another interesting finding was seen in the notary industry where Fednot is steering the DT of the entire sector by creating novel digital products and services for all notaries to use. Lastly, one of Verso-net's core tasks is showing information technology (IT) players that working for the social profit sector is valuable as many small players have the same needs, and thus digital projects could have the same scale as in the profit sector.

The novel digital transformation products created by the trade associations

Aside from the core tasks, most TAs also aid the DT of their industry by bringing digital products and services to their members and market. These are usually developed on demand of the federation by a third-party IT developer and funded by the federation's membership income or sold to their members for a fair price. The initiation of these projects often comes at the request of the TAs' members.

Most digital products developed by TAs are situated in the digitalization of administrative tasks. For the waste and recycling industry, Denuo created ewastra, an online platform to digitalize shipping documents in Belgium. They hope ewastra becomes the accepted standard in the industry otherwise the market will become shattered into 10 different platforms. Similarly, TLV created digital transport documents that contain all the information about the goods and the transport. They also created tools to automatically process road taxes for their transport members. Boerenbond invested in Focus, their popular accounting software solution for Belgian farmers. It is an accounting tool specialized for farming with additional support for data-based decision-making. BilltoBox is an initiative from ITAA to digitalize the billing of tax advisors with the additional features to sell invoices safely to debt collection agencies with risk assessments of creditors. In addition, ITAA created Excel templates to aid with several accounting documents such as the financial plan. As the last example, Medaxes created online templates to aid its members with filling in new drug applications, quality controls and regulations.

Besides digitalizing the administration, a large effort is being done to develop new products and services. Denuo started a gig-economy platform as a pilot project to connect waste with waste collectors. In a similar vein, Lextra-lingua is testing a platform in which translators can indicate their availability and juridical institutions can book their translation services. ITAA created a portal website where members can exchange documents, data and

information. Some of these uploads are mandatory while others are voluntary. The website also offers tools for permanent training follow-up, quality checks and internships guidance. They also created, in collaboration with Fednot, eStox to replace paper-based share registers. For construction, Bouwunie developed a list of tools to check the financial health of contractors, simulate wages or estimate project prices, calculate insulation values and so forth. In the generic drug market, regular price changes require resource-intensive processes to update the companies' portfolio pricing. To facilitate this process, Medaxes created EZ-AXES, an online platform where members can update their entire portfolio pricing with one click. The last example includes three products developed by Fednot: Biddit, an online auction platform for real estate; the Belgian notary network, where notaries can securely communicate, sign, share and authorize deeds; and Izimi, a digital repository to safeguard individuals' deeds and documents.

Another service that TAs offer their members is knowledge sharing and linking them with the right partners. To improve knowledge sharing, Voka created a scanning service to measure SMEs' digital maturity. This is followed up with a personalized report and discussions on how to improve, hereby linking the SMEs with the right partners. They also created DigiHubs in each province where digital knowledge is pooled and made accessible to SMEs. Feweb created experience labs where members can exchange knowledge and best practices on DT. Verso-net, on the other hand, created a digital business school for social profit managers to educate them on best practices for digital projects, future scenario planning and general digitalization practices. To aid in linking members to the right IT partners, many TAs create an overview of novel technologies and service providers that offer these. For instance, UDB created a library of dental materials and technologies, Bouwunie created a software database where its members can see trusted software tools and partners, Essencia mapped best practices for novel technologies and their use cases, and VVR created an overview of digital tools for travel planners.

In general, the products developed by the TAs are successful such as ewastra, digital pension websites, ITAA's products, Groeilabz of Verso-net and EZ-AXES of medaxes. These products sometimes take time to gain a foothold into the market, either due to lack of will or lack of features. For instance, ewastra cannot yet be coupled to ERP systems of the waste processing companies which is a major drawback. Other projects, such as the online availability platform for translators, fail due to the industry's lack of digital skills and willingness to digitalize. Training offered by the federations is also popular but there is a large discrepancy between industries. In construction, seminars are hard to fill in due to contractors not having enough time while Feweb's postgraduate enjoyed increasing demand for three years straight.

Discussion

In this paper, we researched two questions: (1) What roles do TAs play to support their members DT? And (2) How are TAs driving the DT of its members? The findings add to the existing body of knowledge where these gaps were present.

The role of the federation

Our results indicate that TAs can have a positive role in the DT of their members. Aside from the core tasks and developing digital products, there are several other roles worth highlighting. First, TAs aid in the acceptance of a digital product in the industry. Either by creating or supporting the development of a particular digital solution, the federation convinces the industry of its benefits and position in the market. Without this support, a multitude of different applications for the same problem would likely be developed by third

parties. This would result in multiple standards that would make each application less attractive due to its limited users in addition to the added complexity of multiple applications to choose from. For instance, this would have been the case in ITAA and Denuo if they did not develop digital solutions such as ITAA's digital billing system and Denuo's ewastra. In other cases, the TA makes sure there is enough interest in a digital project before it is being developed. The government, for example, communicates with Febelfin on certain initiatives who, in turn, survey its members on their acceptance. If there is enough support, the project gets greenlit. Their role is essential for the acceptance of future products, as the government does not have time to consult over 225 financial institutions.

Secondly, by being the spokesperson between the various stakeholders in DT initiatives, federations can raise specific problems and requirements that the industry needs, and make sure those requirements are taken into account. For instance, BBOT mentions that on two occasions, the government created digitalization projects without their input. Both products failed as the specific requirements of the industry were not met and thus their usage was low. Similar findings were found in ITAA, Feweb, Febelfin and VCB. Hence, the success of digital projects developed by the government can be increased by having close collaboration with the TA during the initiation and development phases.

Thirdly, industry members would be less informed without their TA on important topics dealing with DT. By centralizing knowledge, members can easily access up-to-date information about their sector. Sometimes, this is necessary when essential information about the sector is complex and spread among a wide range of sources. Lextra-lingua, for instance, states that a federation is needed to translate the Belgian regulations into useful information for their members who do not have the time to do this. Other times, this knowledge would not reach the industry players without the TA because the members do not know it exists, or they do not care enough to actively research it. This is the case for cybersecurity and exoskeletons in construction, digital marketing in small travel bureaus or mouth scanning technologies for dentists.

Fourthly, our results suggest that the overall industry's digital maturity would be lower without the TA. Especially small players are often inspired by the TA that highlights novel technologies, success stories and guidelines. They also help and push innovation initiatives of the pioneers in the industry. At times, the TA develops digital products to be used in the entire industry such as administration software for farmers. In extreme cases, such as Fednot, the TA is the sole innovator and is responsible for the entire DT of the industry as the individual members do not have the resources or the knowledge.

Lastly, an interesting finding was that TAs can also play a role in the protection of the data ownership of their members. This was evident in Boerenbond's effort to protect the farmers of their ownership of sensory data from the equipment manufacturers. They created together with several other organizations a European code of conduct about farm data that outlines to whom the data belongs and in which conditions this data can be shared. This in turn opened possibilities in AI and data mining for the farmers to do something useful with this data.

Despite the large efforts of federations, large industry players are the major digital innovator as mentioned in 55% of the interviewed TAs. For instance, the largest dental technology firms create and manufacture 3D mouth scanners. Their innovation is then, however, highlighted by the federation to inspire the smaller dentists to adopt this technology. In 20% of the cases, changing regulations and government digitalization are the major source of innovation. For pensions, for instance, the government appointed the software company Segedis with the task to digitalize pension applications. Small players, often software and service companies, are mentioned as nimble innovators in 15% of the interviews. Nevertheless, TAs play a large role in 30% of the industries. Sometimes this is in the form of developing software applications such as Lextra-lingua creating an online registry, or in agriculture where the federation Boerenbond created accounting software, or in

the generic drug industry where Medaxes created EZ-AXES. In other cases, the federation plays a key role as is the case in tax advisors where ITAA is the main driver of DT, although government regulations are sometimes needed to boost the adoption of their digital solutions. In extreme cases, such as Fednot and the notary industry, the TA is the sole driver of DT.

It is interesting to see the discrepancy between the importance found of TAs on the DT of their industries, and the limited literature available on the topic. Most existing papers on the topic only focus on a certain perspective, such as its role in data standardization (Ickrath, 2018) or solving skill gaps (Hovenga *et al.*, 2018). There is a lack of research on the complete role of TAs on the DT of their industry members. This could be because TAs are often overlooked, or that their workings are behind the scenes in most industries. Bringing TAs working to light is an important activity for DT researchers going forward.

How trade associations drive digital transformation

To validate the second research question, we inquired each federation about the changes happening in their industry and the drivers that steer them. Using the interaction-based DT framework lens, an actor driving the DT can be understood as an actor influencing the drivers of that industry. Hence, in each interview, we indirectly questioned how the federation steers the DT of their industry and which drivers they reinforce. A summary of our findings on how TAs reinforce the DT drivers is shown in Table 5.

In general, a majority of drivers is actively being influenced with the main focus on influencing regulations, highlighting customer and employee demands, and promoting possible technological improvements. Other major drivers that are being influenced are warning for digital threats, demanding for or investing in digital technology, promoting the use of big data analytics, promoting the digital benefits to customers or clients and promoting government digitalization. The other drivers are less influenced by TAs, especially little is done about new customer opportunities, network effects and changing values. These findings are rather logical, as these drivers are hard to directly influence. On the other hand, the society to business and business to society drivers can be influenced but are not influenced considerably. In conclusion, TAs seem to be a major player in driving the DT of their industry.

These findings suggest that TAs can have a major opportunity to increase the DT of their industry by investing more resources in the drivers from society on business, and business on society. The former can be done through customer surveys on digital needs, outlining novel opportunities a digitalized customer base can bring to the industry such as online platforms and the gig economy, warning the industry of online backlash and thinking about network effects and how to use them in your advantage. The latter can be improved by being more customer-centric. By highlighting the benefits of digital products by customers, adoption rates can increase. Other ways include forcing adoption by making the nondigital services unattractive and empowering customers to be co-creators or stakeholders.

An overview of how TAs can drive the DT of their industry, based on the theoretical research lens of the interaction-based DT framework, is shown in Figure 2. A change to the original framework was made, as a major missing driver between society and business was regulations, according to the findings in Table 4. In many TAs we interviewed, new regulations were mentioned to have made digitalization mandatory in the respective industry. This is in line with public institutions digitalizing themselves and then making it mandatory for their industry partners to follow.

Theoretical and practical implications

This paper contributes to the DT theory by investigating the role of TAs in the DT of their members and industry. Not only was a TA found to have a positive impact on the DT

Federation	Drivers Technology → Business				Drivers Society → Business					Drivers Business → Society					Drivers Technology → Society					Drivers Business → Technology				Drivers Society → Technology			
	Improvements	Digital threats	Standardization	Big data	Customer/employee demands	New opportunities	Online backlash	Network effects	Regulations*	Benefits	Force adoption	Customer empowerment	Changing job profiles		Diffusion	Government digitalization	Standardization	Changing values		Demands and R&D	Compatibility	Purchasing power		Government legitimation	Demands	Diffusion	Network effects
Denuo	X		X		X			X	X	X					X	X	X			X	X			X		X	X
PensioPlus	X				X	X			X	X	X				X	X				X		X		X	X		
Bbot	X	X							X	X		X	X			X								X		X	
VCB	X		X		X				X			X								X	X						
Boerenbond	X			X	X		X													X	X			X			
ITAA	X			X	X				X		X					X				X		X		X			
UDB	X	X	X		X							X					X							X			
NVKVV	X		X						X															X			
Bouwunie	X	X	X		X	X				X			X							X					X		
2mpact	X	X			X																						
Verso-net	X			X	X				X															X	X		
Essencia	X	X			X		X		X											X							
Medaxes	X	X		X	X				X	X														X			
TLV	X	X			X				X						X					X				X	X		
Lextra-lingua	X								X	X						X				X				X			
Feweb	X	X								X					X					X				X		X	
Voka	X	X	X	X		X	X	X	X	X			X		X	X				X	X			X	X		
Febelfin	X	X	X	X			X		X	X	X	X			X	X				X	X	X		X			
Fednot	X	X		X	X	X			X	X	X		X							X	X	X		X	X	X	X
VVR	X	X		X											X									X			
Total	20	12	7	8	13	4	4	2	14	10	4	4			4	7	7	2		0	13	6		4	16	5	5	2

Note(s): *Added driver compared to original framework

Source(s): Drivers adapted from Van Veldhoven & Vanthienen (2021)

Table 5.
Overview of digital transformation drivers enacted upon by federations, based on the interaction-based framework

maturity of their members, the intersection of TAs and DT was almost nonexistent in the literature. By shining a light on the working and importance of TAs, we hope to bring more attention to the interesting role of TAs in general. Moreover, this paper extends the theoretical foundations of DT. The popular interaction-based DT framework (Van Veldhoven & Vanthienen, 2021) was extended with empirical evidence with high overlap of the proposed drivers of DT outlined by the framework. This further validates the main strength of the framework, namely its function as a foundational research lens for DT research. Building upon previous theoretical frameworks is an important task in information systems (IS) research to improve the body of knowledge and harmonize various school of thoughts.

The practical implications of this study are twofold. First, it can inspire existing TAs in their role in the DT for their members. Many interviewed TAs lack several activities that they can do to aid their members with their DT. This can be due to lack of resources, lack of need or lack of knowledge. Nevertheless, the findings of this paper can be used to point out opportunities. Secondly, industries can be informed about the benefits of an overarching body and can be inspired to set-up a TA for their industry or region. Especially industries comprised of smaller players can gain benefits from installing a body that represents, aids and lobbies for them. In our belief, not enough researchers recommend a TA for aiding the DT in such industries.

Limitations

The main limitations of this study stem from the qualitative analysis performed on open-ended interview questions across 20 Belgian TAs. First, the selection criteria for interview invitations are biased towards TAs that are active in DT. Secondly, the low-response rate can be another bias towards digitally mature TAs as those are more likely to accept interviews about DT. Thirdly, it is uncertain if these results are generalizable to other TAs, industries or countries. The answers to the research questions provided in this paper are an initial reflection, and more research is needed to find out how generalizable they are. Finally, it is worth noting that these findings stem from the TAs themselves and their perspectives. Interviewing both TAs and their members could uncover a more nuanced view on TAs' role and how they drive DT.

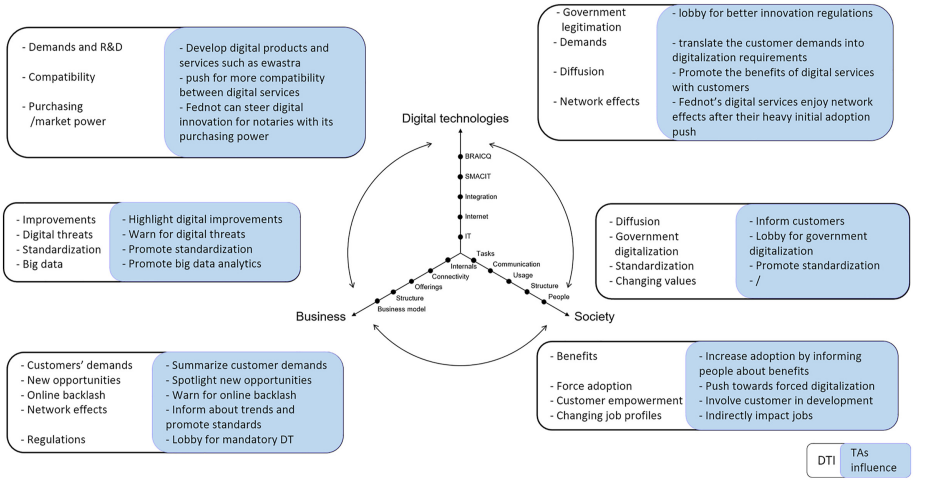


Figure 2.
An overview of how TAs drive the DT of their members, expanded upon the interaction-based DT framework (Van Veldhoven & Vanthienen, 2021)

Source(s): Adapted from Van Veldhoven & Vanthienen (2021)

Future research

This paper is among the first studies to investigate the role of TAs in the DT of their members. Many research avenues can be further explored to better understand their role and impact. A major research avenue is to empirically investigate the benefits a TA can provide for its members. This can be done by comparing industries with and without TAs, or by investigating industries' digital maturity before and after the creation of a federation. There is also room for investigating how the number of members, and thus resources, the TA has, impacts their role in DT.

Another interesting research topic is to investigate under what conditions TAs are most effective. In our research, we have seen two industries where membership in the federation is mandatory, Fednot and ITAA, and both federations had a major impact on the DT of their members. Not only the resources but the member share of the represented market seems to be crucial factors that influence the degree to which TAs can operate. There should also be done more cross-country research to compare TAs effectiveness and differences, or under which conditions industries are willing to create and become a member of a TA.

Conclusion

In this paper, we investigated the role and drivers of TAs in the DT of their members based on 20 interviews. We contribute to the DT research knowledge base by expanding upon these two knowledge gaps. The findings indicate that TAs play many roles in supporting the DT of their members but there is a large discrepancy between TAs as outlined by the summary of TAs core tasks, challenges they face and types of digital products they create. In addition, we highlight their potentially beneficial role in the DT of their industry and illustrate how they drive DT based on the interaction-based DT framework. Many drivers of DT are actively being influenced by some TAs. This paper is among the first studies to investigate the intersection between TAs and DT and calls for more research into this interesting and evidently crucial collaboration.

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Appendix
Interview questions

Part I: introduction

(1) Could you describe the sector in which the TA is located?

(2) Which companies are member of the TA and how much % of the total market do they represent?

(3) How is the TA monetized?

(4) How many employees does the TA have?

(5) What are the core tasks of the TA?

(6) How is the TA organized?

Part II: the need to embark on DT

(1) Does the sector feel the need to digitalize?

(2) Does the TA feel the need to digitalize?

(3) What are the factors driving this need to digitalize?

(4) Is a digital strategy created to deal with this need, and what is it?

Part III: past DT projects:

(1) Which DT projects have been done or are ongoing in the sector?

(2) Which DT projects have been done or are ongoing in the TA?

(3) Which changes were necessary to fulfill these projects?

(4) What were the major barriers to fulfill these projects?

(5) How are these projects financed?

Part IV: the role of the TA

(1) Who leads the DT, the TA or the industry players? Who does what?

(2) What is the TA's role in this digitalization process?

(3) What can the TA do that the individual members cannot?

(4) Would the sector be as digitally mature without the TA?

(5) Are your projects successful?

Part V: future DT projects

(1) Which DT projects are planned in the sector?

(2) Which DT projects are planned in the TA?

(3) What is the long-term goal of the DT plans?

(4) What future trends are the biggest challenges?

(5) What future trends are the biggest opportunities?

(6) What is the ultimate goal of the DT?

Part VI: drivers:

(1) Does the TA influence the technology innovation in the industry?

(2) Does the TA invest in or develop technology themselves?

(3) Does the TA promote compatibility between technological solutions in the industry?

(4) Do you promote the use of certain technologies in the industry?

(5) Do you warn the industry for technological changes?

(6) What is the TA's role in regards to the customers of its members?

(7) Does the TA promote or market digital solutions of the industry to the customers of its members?

(8) Does the TA map customer changes and wants?

(9) Does the TA investigate opportunities in collaboration with the customers of its members?

(10) What does the lobby work of TA include?

(11) What is the role of TA in regards to the public institutions, government and law makers?

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