Interfaces of complexity
Participation as explorative process for organisational development

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Abstract
This paper introduces the concept of "interface of complexity" as a source of creating and dealing with possible participatory approaches to organisational development. Based on an actor-network-theory approach, we conceive of interfaces as complex events, situations and transitions in a technical as well as in a non-technical sense. The latter are thought of as process or interaction interfaces between persons, departments and different echelons. Both types of interfaces cause ambiguity, conflicts or problems of translation and by that they challenge established practices, prompting novel ways of rethinking or redesigning organisational processes. We conceive of spaces of participation not so much as innovation hubs or similar structures that are deliberately founded to foster innovative approaches and solutions. Rather, they are exploration processes generated by interfaces of complexity between different actors or units. Based on the qualitative content analysis of a series of expert interviews with IT and process managers, we reconstruct the measures, taken by managers and their teams, to cope with the ambiguity and irritations originating from interfaces of complexity. By transforming those interfaces into practices that open up spaces for common exploration processes of problem solving, participatory approaches can be shown to be a major steppingstone for organisational development.

Keywords: *Complexity, interface, organizational culture, organisational development, participation, digitalisation.*

Track: *Management*

1. Complex interfaces as modes of rethinking organisation

1.1. Managing the "in between": the proliferation of "interfaces"

By conducting a series of qualitative interviews with managers working in Central European locations of medium enterprises and big corporations, we aimed at a better understanding of the relationship between organisational culture, conceived of as the everyday routines, informal expectations, framework and dynamics characterising interaction (Goffman, 1974; Mead, 1934; Kühl, 2011), and the challenges every business is currently facing against the background of digitalisation. It may sound like a banality to state that "you can't have one without the other", i.e. that the necessity of integrating the new digital technologies goes along not so much with the substitution of human labour by algorithms and machines, but rather with a redesigning of the interaction between humans and technologies as well as of the human cooperation within and beyond organisations. From the point of view of organisational development, the question that leads us beyond banality is how to find the adequate way, for the respective business, to organise these new forms of interacting and cooperating.

It may be due to the fact that the majority of our interviewees have executive roles in IT departments that many of them used the term "interface" in order to describe the growing interdependence, the tight entanglement of the manifold steps, stages, divisions, departments, roles and tasks contributing to the production of goods or the delivery of services. In an ever more specialised, technologically driven world of working together, innovation and value creation seem to happen, more often than not, somewhere "in between": in the passage between different departments, between distinct tasks or competences, between modes of thinking and acting. Organisations more and more display a certain degree of diversity, due to the intergenerational and intercultural staff composition, but also due to the coexistence of different generations or types of technologies that require activities or processes of integration or translation in a very broad sense of the term (Latour, 2005). When problems emerge, be they of technical, organisational or human nature, they often do so at the border between different "languages" or "cultures": between technologies, between different departments or organisational structures, between different modes of understanding, of knowing, reflecting and operating. By adopting the term "interface", the interviewed

experts referred to events, situations or (potential) transitions that constitute not only a technological or organisational challenge by demanding new processes and structures, but also a challenge in terms of organisational culture by prompting new forms of communicating, of doing things together. In this sense, problems have to be resolved "in between" as well, by adapting and modifying technologies and organisational structures, as well as by involving people in decision making, by creating a common understanding via novel forms of participation.

Thus, when referring to these intermediate spaces of potential value creation by problem solving, our interviewees seemed to have in mind a broader—at a first glance metaphorical—meaning of "interface" compared to the technical sense of the term. According to them, the passages and problems they described have to be addressed by applying or building up "integrative" knowledge, by extending and changing the existing ways of specialised working within their organisation. By using the term "interface" not less than four times in a short passage, one of the interviewees outlines a new management function between specialised business departments and the equally specialised IT department (interview 12). He describes the "management of interfaces" as a permanent translation activity that requires profound knowledge in both of the realms but goes beyond specialisation in that it requires the ability to connect the specialised forms of knowledge and to translate business opportunities into technological possibilities and vice versa. In addition, this process also requires a series of social competences in order to be acknowledged as an interlocutor that in some way acts beyond the hierarchical logic of the organisation.

Hence, the term "interface" allows those managers to interpret their role in opposition to the restrictive conception they are often confronted with when dealing with the claims of other departments. In their function as heads of IT departments, they often are asked to "integrate" external software solutions in the IT architecture of their organisation, i.e. they are expected to deal with "interfaces" in the narrow, i.e. technological, sense. Yet, by addressing a seemingly technical problem they often open up a reflexive, communicative process that can lead to the transformation of production processes or to forms of organisational development that were not intended by the original claim. As one of our interviewees ironically states, purchasing an (external) software solution often appears as an expensive way of avoiding (internal) organisational change (interview 02). In opposition to this refusal to rethink and redesign processes of working together, our interviewees, by referring to their own practices, outline a space of participation in which the managerial function is not abolished but transformed and adapted (Laloux, 2014; Arnold, 2016). Management does not simply exert, claim or cede decisional power, but organises the complex interfaces emerging between given organisational structures by suggesting which type of knowledge, which competences have to be assembled for which types of problems and by adopting a moderating role, i.e. by suggesting how not only the decision-making, but also the communication and cooperation processes are to be organised.

1.2. Reassembling the organisational: re-sources of uncertainty

Actor-network-theory enables us to acquire an analytical perspective on organisations forced to act in an uncertain world (Callon, Lascoumes and Barthes, 2009) characterised by the necessity to design organisational processes in reaction to unexpected events (Weick and Sutcliffe, 2015). Managers cannot rely on stable features, structures or any certainties that would allow them to continue their "business as usual". Instead of acting like they have been used to, they have to learn to deal with uncertainty, to tolerate ambiguity. Otherwise, if they continue to pursue the objective of restoring a state of unambiguity, they risk losing the potential wealth of complexity that lies in the opening up of new business opportunities, the opportunity of individual and organisational learning, a higher involvement of team members and the passage from routine activities to innovative and purposeful forms of working and collaborating.

By adopting an actor-network-theory approach, we conceive of the complex interfaces our interviewees were talking about as sources of uncertainty (Latour, 2005). This means that we categorise the events, situations and transitions referred to by the use of the term "interfaces" as potential resources for value creation and organisational development, but at the same time as potentially endangering existing organisational structures, processes and ways of interacting. Instead of trying to restore unambiguity through hierarchical decisions, the managers interviewed by us described their dealing with complexity as efforts to create reflexive, communicative environments evolving around problems and ambiguities. These environments generate the opportunity to restructure the space of cooperation. In an uncertain world, management has to raise the awareness for where and when innovative impulses and ideas for the solution of problems emerge and how they can be integrated in the existing structures and processes.

The term "interface" seems to appear when there is a basic uncertainty concerning the question in what form the innovative impulse is to be organised and institutionalised. A "complex interface" is an event, situation or transition in which the necessity or opportunity to reorganise cooperation becomes visible, but due to the complexity there is no given "one best way" how to reorganise it. In one of the interviews, the IT department head of an automotive industry supplier talks about the opportunities of making use of artificial intelligence and "machine learning" in his business. To him, it is not at all certain which department should initiate or lead the possible introduction of such a technology in his organisation. He defines this topic as a testing ground not only in terms of the technological evolution and the opportunities deriving therefrom for his business, but also in terms of organisational processes and structures (interview 01). According to the way in which this new technology will be introduced, it will be shaped by, as well as it shapes, the process of reorganising the respective business and the way of interacting and working together.

Actor-network-theory provides us with the possibility not to determine in advance the identity, realm and limits of an event, an action or an actor, but to reconstruct the dynamics of "assembling" the diverse forces, subjects and structures involved. In this sense, it helps us to better understand the phenomena of transition of which our interviewees have given us many accounts: between technologies, organisational structures, processes, types of knowledge, persons, but also between technologies and processes, between types of knowledge and persons, between knowledge and structures and so on. We have tried to categorise some of these phenomena of transition by taking up their characterisation as "complex interfaces" and asking what kind of management (actually and potentially) emerges when organisations deal with them. Since they challenge given hierarchies, we try to reconstruct in what sense and to what extent the management of complex interfaces, by assuming the form of an explorative process, contributes to participation in organisations.

2. The interview sample and the categories for the coding

2.1. Digitalisation and the development of new organisational forms

On the one hand, "digitalisation" has become a buzzword that accompanies any debate on future evolutions in any type of business, leaving little space for more differentiated analyses. However, recently some attempts have been made to take a closer look at the concrete organisational dynamics and change processes that occur under the aegis of "digitalisation", "industry 4.0" or "work 4.0" (Kohnke, 2017; Meyer, 2018). On the other hand, there is no doubt that the new technologies are transforming and will continue to transform many businesses and therefore have a huge impact on strategy as well as on organisational processes. As a consequence, public administrations in various countries, such as the German Federal Ministry of Labour, have set up platforms for reflection and exchange between academics, experts, policy makers and practitioners (Bundesministerium für Arbeit und Soziales, 2017).

The original reason why we conducted a series of 13 interviews with 14 executives was our engagement in some organisational development projects aiming at improving the cooperation between IT departments and other business units. As our intention was to compare the situation of the IT departments we were accompanying in those projects with that of IT departments in other organisations, we made a survey and, on the basis of the results, set up a semistructured guide for the qualitative interviews. In a first analytical step, we reconstructed the respective position of the IT departments in terms of involvement in strategic decision-making, decisional power and the capacity to initiate and implement organisational change. By operationalising a field-theoretical perspective (Fligstein and McAdam, 2012), we worked out the relations between the actual influence and power of the IT departments, i.e. their positions in the organisation as a social space, and the way they expressed their positions on organisational issues, i.e. their ability to socially shape the transformation processes induced by the digital technologies.

As we went on with the interviews, our focus began to shift more and more towards the relation between the dynamics of organisational culture and the effectiveness of organisational change projects. In the first attempt to reconstruct how digitalisation and organisational culture are intertwined we had been interested in the structure of the social space in terms of symbolic influence and social capital (Karahanna and Preston, 2013) as a bundle of competences enabling IT departments and their heads to initiate and manage organisational change. However, in a second step we aimed at capturing the processes that make change and development possible and enduring in terms of the assembling or associating of diverse forces, subjects, ideas and competences within the organisation, without there being a clear strategic agenda, an established structure or process or any kind of recognisable underlying power, influence or

agenda. For this reason, we opted for actor-network-theory in order to accomplish the qualitative interpretation of the interview sample.

2.2. Composition of the sample

As stated above, the interviewees all have executive roles, mostly in IT departments, in medium enterprises or big corporations that cover a wide range of economic activities in the manufacturing and the service sector. Some of them operate as providers of public services while others are strictly market-oriented (Table 1). We divided them in three major categories: manufacturing (interviews 01-05), entertainment, data and IT services (interviews 06-10) and infrastructure, health and insurance (11-13). The interviews were conducted between June 2017 and November 2018.

Table 1: Interview sample	
Manufacturing	
Interview 01	Automotive Industry Supplier
Interview 02	Plant Construction and High-tech Corporation
Interview 03	Metal & Plastic Manufacturer
Interview 04	Food Industry Company
Interview 05	Toll Manufacturing Company (2 persons)
Entertainment Industry, Data and IT Services	
Interview 06	Gambling Industry Company (person 1)
Interview 07	Gambling Industry Company (person 2)
Interview 08	Data Analysis & Digital Publishing Company
Interview 09	Data Analysis for Economic Research Institute
Interview 10	IT Services Company
Infrastructure, Health and Insurance	
Interview 11	Energy Provider
Interview 12	Mental Health Care Institute
Interview 13	Insurance Company

All interviewed managers, being responsible for the IT department or for the process and quality management of their companies, consider themselves as service providers inside and sometimes outside the firm. However, the conception of "service" has changed significantly in the last years and currently implies, according to our interview partners, profound knowledge in production and business processes as well as strategy and, if possible, involvement in change projects and strategic decision-making. It seems that these managers have been building up the self-perception of operating not only on behalf of their teams in the realm of a specialised department with limited tasks and responsibilities, but, as initially stated, "in between" the confined spaces of departments or business units. Maybe this is the most important reason why they never treat technological or process-related issues separated from the social dynamics of the organisation. The term "interface" turns out to be a kind of cipher for their searching for "alternative" or "extended" spaces in which exchange and participation can be organised in a more effective way than it actually is, according to them, in their companies.

2.3. Coding the interfaces of complexity

For the coding and qualitative interpretation of the interviews (Gläser and Laudel, 2010) we conceived of the term "interface" as a "mediator" in the sense Latour (2005) uses this concept in opposition to "intermediary". While an intermediary is an element that stands for non-problematic, non-complex forms of passage from one stage, process or form to another, a mediator has the potential to reorganise the passage, i.e. the relations between the element and its environment, its network. Actor-network-theory attributes agency not only to human beings, but also to processes, structures, technologies, instruments and other kinds of objects. In this sense, a mediator can cause problems by introducing or raising the complexity of a passage, but at the same time it can also induce new ways of thinking, of problem solving, of interpreting the passage. We set up our table of categories for the interviews by taking up the use of the term "interface" as it occurred in several interviews and applied it systematically to all the accounts our interlocutors gave on situations, events, or transitions with the potential to change or extend given knowledge, routines, processes and forms of cooperation. What we did by interpreting the interviews was

to trace the modification the managers had accomplished by their use of the term "interface": they had translated it from a seemingly non-problematic technical term, indicating the passage from one material, technological, organisational or symbolic state to another, into a problematic account, describing a complex situation in which technological change and organisational culture are intertwined.
There is another remark to be made regarding the use of this concept as a "mediator". Since the interviews were conducted in German, our interviewees used the term "Schnittstelle", which is usually translated into English by the term "interface". Yet, while the English term evokes the association of something, maybe a surface or a membrane, between two states, the German term indicates also the process of separating the two states by a cut ("Schnitt"). The German noun "Stelle" means "place", "position", or "point", so that other possible translations of "Schnittstelle" are "point of intersection", "cut surface", "port" or "cut" (in the cinematographic sense). However, both terms, "interface" as well as "Schnittstelle", indicate the possible problems emerging when elements, diverging by their nature, intersect and transform, by their encounter, a one-dimensional point into a two-dimensional surface or even a three-dimensional "place" where the diverse elements can be reassembled.
In our attempt to reconstruct the forms of associating and assembling different elements described by our interlocutors, we divided the term "interface" into four subcategories: technological, organisational, social, and semantic (Table 2). While the technological and organisational interfaces can be subsumed under the more general term "techno-organisational", the social and semantic interfaces can be subsumed under the term "cultural". Whereas the techno-organisational interfaces refer to passages between technological processes or technologies (applications, software, hardware) and between organisational processes or methods of work organisation, the social and semantic interfaces display a more detailed variety of subcategories. Social interfaces can occur between single persons, between, departments, between different echelons and between the organisation and its customers or cooperation partners, while semantic or communicative interfaces can occur between different ways of interacting and managing knowledge, between different ways of problem solving, of cooperating or between different ways of communicating within cooperation (Cooren, 2000).

Table 2: Categories of interfaces of complexity

Techno-organisational		
	Technical	
		Between technologies
		Between technological processes
	Organisational	
		Between methods of work organisation
		Between organisational processes and process designs
Cultural		
	Social	
		Between persons
		Between departments
		Between echelons
		Between organisation and customers
	Semantic	

		Between different ways of interacting and managing knowledge
		Between different ways of problem solving
		Between different ways of cooperating
		Between different ways of communicating

2.4. Three fundamental types of interfaces

Starting from this division in two major categories of interfaces, further specified in 12 subcategories, we aimed at setting up some fundamental common characteristics and established three major types of complex interfaces, in order to trace the entanglement of techno-organisational and cultural issues.

The first type of interface can be characterised as potential and therefore of strategic importance. It occurs between different knowledge and interaction cultures against the background of the possible implications of future technological evolution for the respective organisation. In the above quoted example of the potential introduction of artificial intelligence in the automotive industry supplier firm, the interface is located between the future technology, possible users and the strategic management (interview 01). Since it is not clear which department should initiate and manage the introduction, the interviewee, in a first reflection step, attributes the responsibility to the top management where usually strategic decisions are made. Then he relates the introduction of such a new technology to the tight intertwining of stakes, issues and knowledge between the single echelons and departments and suggests a new management figure, possibly at eye level with, but not pertaining to, the single departments, but still endowed with a profound understanding of the specialised units and knowledge areas. At the end, he shifts to the problem of "leadership" and describes the ideal executive style for a successful dealing with new technologies and the business challenges in the era of digitalisation. According to him, such a new style is characterised by entrusting people with motivating, purposeful and interesting tasks that give them the chance to learn and grow, by opening up areas for testing and experimenting. Hence, starting from a problem that could have been articulated completely in terms of "interface between technologies" and attributed to the top management's strategic decisions, he ended up by outlining the organisational culture, i.e. the interfaces between knowledge and interaction modes that are required to address and shape the technological challenge. Therefore, it is not at all clear where the decisive impulse emerges and how such a strategic realignment should be addressed; the complexity of the issue suggests that it can only be successfully addressed by a high involvement, by an intense participation of all departments. Yet, the organisation still has to find the adequate organisational forms for such a process.

The second type of interface is located not at the strategic, but at the operational level. It occurs between knowledge and interaction cultures, between ways of cooperating and between ways of communicating. In these cases technical innovation has already taken place and creates the necessity to process the emerging complexity by the alignment of approaches to labour division and cooperation as well as of ways of communicating. As machines, technologies and processes are more and more interconnected, more and more data are produced that are important for other operators along the production or service line. People have to build up "integrative" skills, they have to mentally connect things faster and take over other people's perspectives (interview 04, 11). This entails a different concept of cooperation and challenges well-established roles and expectations. Similarly to type one, this interface enables novel forms of encounter at eye level and thus can lead to a new culture of working together. Especially in reference to the introduction of agile work organisation not only in IT departments, but across the whole organisation, executives are not able any more to impose their conditions by exerting their hierarchical power and have to adapt their expectations and behaviour in the sense of a more involving and moderating executive style (interview 06, 08). They do not decide alone and have to learn to give reasons for their decisions (interview 10), which means that they have to learn what it means to be challenged by collaborators or colleagues from other departments. Whereas on the one hand communication channels are more flexible and open within an agile organisation, both sides, executives and employees, have to learn to deal with this new openness and uncertainty with respect to decision-making. There is a higher degree of mutual accountability, which yet does not answer the question how this communicative interface should be organised in order to prevent chaotic forms of interaction that threaten to destabilise the organisation. Interviewee 12, IT head in a mental health care institute, talks about how radically the

role of his department has been changing in the last years. While at the beginning the department's self-concept was that of an infrastructure service provider, his team nowadays considers itself a "business partner". This change in the self-concept has been possible because the department managed to create communication and interaction forms at the interface of different knowledge cultures. It has taken over the role of a data analyst by building up a deeper understanding of the business processes and of the possibilities to fruitfully connect knowledge in form of data exchange and data streams. This new role as an internal business partner allows the IT department not only to connect data in a technological sense, but to connect people at the interdepartmental level, communicating to the various departments the mutual needs and opportunities to exchange knowledge and cooperate. By connecting different modes of knowledge production the members of the IT department have enabled the creation of participatory forms of business and organisational development.

The third type of interface is also located at the operational level and challenges the organisation from within as well as from outside (interview 13). It regards organisational processes, occurs between different knowledge and interaction cultures, between different ways of communicating and connects different departments. Due to technical innovations that allow faster reactions to changing and less standardised needs, customers (or the external environment of the organisation) get closer up to the point of being partly integrated in organisational processes: it is possible to deliver and analyse data on changes in demand and consumption or customers' wishes (almost) in real time. This requires diverse and much more dynamic sales processes involving different departments that formerly were not involved in the processes. Such an integration process goes along with the necessity to align different knowledge and interaction cultures and create a common language and understanding (interview 07). Interviewee 08 who works for a digital publishing company has created a data-analytics tool that enables customers to determine the price of their used cars so that they can put an offer on the virtual market place provided by the firm. In an interesting passage he describes that the customer-provider relationship gets fuzzy and at the same time intensifies the innovation process within the organisation. The fuzziness of the inside-outside relation does not only concern the customer side, but also the relationship with other departments. The rhythm of interaction in terms of data exchange and analysis has been accelerating so much that it is almost impossible to draw a separation line between the departments in everyday interaction. Also interviewees 07 and 02 state that some of their collaborators have their workplace in other departments in order to be able to take up the needs in real time and to evolve a common understanding of the problems to be solved. Intra-organisational "demarcation lines" are blurred, so that the "points of intersection" transform into "surfaces" or "places" of encounter and participation.

3. Participation: solutions, styles, perspectives

3.1. Explorative spaces for participation: three modes

Against the background of these three fundamental types of interfaces, it is possible to take a closer look on the diverse forms of participation our interviewees have described in terms of explorative spaces for organisational development.

(1) With respect to strategic development, one can state that they are witnessing a tendency to abandon top-down strategy development in favour of approaches that strive to connect the crucial competences for specific issues and to develop the respective strategy by involving diverse echelons into the process. Interviewee 11 has established such development projects, labelling them "departmental strategies", by assembling the heads of different departments in order to integrate possibly every service of his organisation in terms of customer experience. As a consequence, also the long term strategies with goals to be obtained within up to 5 years, "have to become more agile", as he puts it.

(2) Coordination and implementation at the operational level do also evolve more and more between different departments, which in terms of participation requires a non-hierarchical executive style. The successful application of agile methods depends on the ability of managers to delegate responsibilities, to involve collaborators in decisions and to allow and enable people to cooperate across departments, share knowledge and take autonomous initiatives. Yet, management still has the task to prevent cooperation from becoming chaotic and therefore must set a framework for cooperation: in which areas involvement is crucial, in which respects is it counterproductive? Interviewee 03, for example, insists on his authority to make the decisions on IT infrastructure, which sometimes entails restrictions for other departments or single employees with respect to the purchasing or use of software programmes. Yet, he points out the

importance to communicate these decisions and to support them with reasons, and this kind of interaction reduces the hierarchical dimension of the decision process.
(3) Not only cross-departmental cooperation intensifies and challenges formal hierarchies, the departmental logic itself is being abandoned. Explorative spaces open up because collaborators of specialised departments get stable office places in other departments (interview 02). By that, the organisation acquires the degree of permeability that allows to design services close to customers' needs or to explore the potential of data exchange and analysis in order to better connect not only the products and services to the needs of the customers, but also the mutual perspectives and needs within the organisation (interview 08, 12). Also in this case, participation is the result of the management of a semantic interface, i.e. of an exchange of perspectives that formerly were separated and organised in a more hierarchical or departmentalised way.

3.2. Structure follows culture (follows structure)

In medium enterprises or big corporations, the issue of innovation is especially difficult to address. Actually, often organisations try to establish participative structures or processes in order to foster the type of thinking and interacting out of the box that is necessary to arrive at novel solutions and ideas. Interviewee 07 gives an account of the "history" of innovation management in his organisation, a gambling industry corporation that has significantly extended its range of products since the introduction and evolution of the Internet and digital technologies. He told us that originally there had been one person responsible for innovation issues that worked separately from the other departments and reported only to the executive board. After a change in the composition of the board, interviewee 07, head of IT, integrated this "lonesome" innovation manager into his department assuming by that the formal responsibility for innovation management. In addition, he began to introduce participative methods for the development of new ideas and solutions. As the ideas and innovative methods began to evolve, he became aware that the IT department did not have sufficient resources to implement them. As a consequence, an autonomous innovation unit with three employees was founded. Yet, the speed and dynamics of the technological evolution were so high that the interviewee began to involve again the board members and all the heads of the business units in order to reflect on possible organisational changes. He organised a trip to Silicon Valley for the board members and business unit heads that, according to him, was very useful for the organisation. After the trip, the board decided to introduce an innovation hub that should be organised by applying the method of "design thinking". Additional staff was hired and, in a second step, an "entrepreneurship challenge" was organised in order to foster entrepreneurial forms of acting within the organisation. Interviewee 07 states that these forms of organisational development have had enduring effects, and maybe the reason for that lies in the fact that the innovation hub was not only the result of a top-down board decision, but of a long lasting process in which several organisational forms to address the issue of innovation were experimented and reflected on before the innovation hub was established.
In this case, "innovation" became a mediator that step by step managed to involve all units and echelons of the organisation by connecting all types of interfaces: between persons, between organisational units, between ways of interacting, but also between the organisation and its environment—which in this case turned out to be the technological evolution of global market represented by Silicon Valley. From our point of view, the account of interviewee 07 is not to be labelled as an example of conformist alignment with globally acknowledged "best practices", but rather has to be interpreted as an organic learning process that had been lasting for several years. All three fundamental types of interfaces of complexity are present in this process: the potential strategic interface in that the question to be resolved was which competences, which forms of knowledge had to be reassembled across the different echelons; the operational interface of intra-organisational cooperation and coordination in that continuous effort was undertaken to connect the different units and to locate the task of innovative thinking and acting in various structures; and the operational interface of interaction with the environment in that the organisational structures were more and more challenged by the global technological evolution, eventually leading to a certain permeability of the organisation by the establishing of "design thinking" methods and an innovation hub that adds something from outside and challenges the logics of business units and specialised departments. However, to organise participation in the sense we conceive of it, i.e. as an explorative space for organisational development, means that management has the task to design this space by asking who or which departments should participate, which knowledge and competences are needed and which methods should be applied (interview 11). Management's effort and responsibility

should be to initiate and coordinate change processes in an organic way, by taking into account the nature of the interfaces to be integrated in the process and being aware of the organisational culture. Transforming formal structures by introducing new units, reorganising the existing ones or by changing or introducing methods, design or processes of cooperating will have an impact on the organisational culture, as culture will have a considerable effect on how new units or methods will be incorporated in the organisational life (Kühl, 2018). Organizing as a process (Weick, 1979) consists in the balancing of these two forces, the formal structure and (informal) everyday culture. The question in terms of an actor-network-theory approach to management is how to translate one language into the other.

3.3. Translation efforts and styles

In interview 05, we had the opportunity to talk to an IT head and a process manager of a toll manufacturing company that takes over stages in a wide range of production processes for a great variety of customers, from big corporations to single clients. In addition, the company employs persons with handicaps, fulfilling by that a social purpose. Due to the variety of the customers and due to the social stakes the enterprise faces, its structure displays a high permeability towards its environment, which in this case are regional manufacturing corporations or furniture retail chains and public administration. As supplier for highly diverse organizations, the company, and especially its IT department, has to find a balance between the requirements and claims expressed by the customers as a precondition for the integration into the overarching production processes and the ability to find autonomous solutions and further develop the company's business in the era of digitalisation. In addition, the management has to fulfil the "integrative" responsibility of providing handicapped employees with purposeful tasks. To produce as a supplier for many different customers entails the necessity to manage the manufacturing of small amounts of different goods instead of big amounts of standardised products. On the one hand, this creates a competitive advantage insofar as the company occupies a niche by taking over small and specialised production steps that no other manufacturer accepts for the lack of scalability. On the other hand, automatisation processes are thought of in a different way since one of the firm's tasks is not to raise efficiency by substituting labour forces, but to support people with handicaps in their interaction with machines.

These conditions have created a peculiar management style with respect to participation. In one case, the IT head has developed a software that, while making a specific process of sawing pieces of wood much more effective from the point of view of the logistic and administrative management, at the same time assigned a higher autonomy and responsibility to the worker serving the monitor that controls the production process. Asked, what kind of competences are required for this type of flexible production processes, both managers indicate the "ability and readiness to change", i.e. a basic openness on the side of the workers that, according to them, is the only condition for being integrated in the process. Instead of conceiving of "rationalisation" as an exercise in substituting labour force by machines, the management creates a safe environment (De Jong and Kessels, 2007) in which the employee is asked to learn to handle the major autonomy and responsibility assigned to him (or her) by the new process. This can be interpreted as another example of an explorative space, because the managers state that in most of the cases the employees accept the working environment created by IT and process management with enthusiasm by identifying with the new task and role and experiencing it as a purposeful activity. That this explorative space has assumed the form of a save environment has, from our point of view, a lot to do with the fact that the process manager and the IT head have established dialogical forms of problem solving and organisational development. If they are confronted with requests from the workers along the production line, they keep "asking back", i.e. they try to thoroughly define the problem to be solved together with the workers instead of immediately providing a software or process solution.

Another manager who refers to himself as a "translator" is interviewee 10 who works for a consulting company that provides software services and solutions for other firms. Maybe due to his professional background he is particularly aware of the problem of interfaces. Holding a degree in building engineering, he worked for several years in an engineering company before he changed to the software branch. In the interview he points out the necessity, for an IT service provider, to take over the customer's perspective and to make efforts of translating the different perspectives of the customer and the provider into one another. This experience of "having known both sides" seems to have coined also his approach to leading a team and shaping the role of an executive. On the one hand, he tries to encourage his colleagues by assigning them motivating and challenging tasks when he has the impression that they are demanded too little in relation to their skills. On the other hand, like interviewee 01, he

expresses the conviction that any kind of authoritarian leadership style is outdated. He has therefore developed an executive style on the basis of which he does not communicate any decision taken by him without providing reasons. In his daily work of coordinating different departments he tries to establish this form of expressing stances and communicating decisions, so that he also asks colleagues in other departments to act like himself, i.e. to communicate not only their decisions but also the reasons that led to them. This seems to be a "simple" communicative habit, but it contributes to open up an explorative space of exchanging different perspectives and views when they intersect.

Among all our interlocutors, interviewee 09 has probably the most evolved views regarding participatory methods and approaches. Although working in the position, like the others, of an IT head, he defines himself a "non-specialised" team leader, an executive with the task to develop his team from a "human" point of view. His attitude to leadership is similar to that of the two managers of interview 05 and interviewee 10, he aims to be a supportive manager who attributes his collaborators ample discretionary powers. In order to implement this new leadership style he has introduced a series of new methods of organising cooperation within and beyond the team. As he works for an institute that provides IT services and data analysis for economic research his team has to cooperate intensely with the researchers of an economic research institute. The working context (data analysis and research for public policy making) is characterised by relatively low rates of staff turnover, which makes it sometimes difficult to introduce new methods, taking into consideration that experienced staff members are not at all used to open forms of cooperation and to a high degree of autonomy. He has experienced that explorative spaces of participation can cause uneasiness and cluelessness and therefore be also rejected by team members.

In his reconstruction of the participatory methods he has introduced, interviewee 09 underlines that when he took office he perceived a lot of existing non-resolved subliminal conflicts within the team and in the cooperation with the economic research institute. In a first approach he introduced methods of nonviolent communication (Rosenberg, 2015) with the aim to open up spaces in which it should be possible for everyone to express subjective views and emotions without having the fear of being attacked for what one said. He declares that he has been inspired to introduce these methods due to his professional exchange with interviewee 04, an executive working for a food industry company. As a second step he completed these nonviolent methods by a technique called "contexting" (developed by a consultant he knew personally). Applying this communication technique, people do not only express their subjective views, but also try to reflect on their needs with respect to the solution of a problem or the implementation of an idea they have. According to interviewee 09, this technique helps to overcome fruitless discussions on whether a stance one takes or a view one expresses is right or wrong. It opens up a communicative space in which not only it is possible to accept and understand other persons' views, but also to shift from analysis and reflection to action. By acknowledging the diversity of the single positions the team is able to establish a more general view, a common understanding that is eventually transformed into a decision by applying the sociocratic decision-making method of "systemic consensing" (Endenburg, 1998). The peculiarity of this executive style lies in the fact that it connects semantic and interpersonal interfaces by acknowledging that specialised competences and knowledge are only one dimension in the process of cooperating and problem-solving, while another important dimension is constituted by the emotions and social needs people do have. Only by integrating these two interfaces, the semantic and the interpersonal one, it is possible to organise cooperation processes based on a high personal involvement.

Interviewee 02 is the regional head of the IT services of a multinational corporation, i.e. he is responsible for the coordination of many IT units in several European and Asian countries. Since the corporation has long time been operating in the area of plant construction, recently its focus has shifted towards the digital factory. Like many others of our interlocutors, interviewee 02 underlines the necessity to overcome departmentalised logics of product, service and business development. According to him, collaborators have to develop a comprehensive understanding of business processes (what he terms "end-to-end-process") and cannot reduce their view to an isolated stage or activity within these processes. In his organisation, members of different departments are involved in business development from the beginning. In addition, he advocates the introduction of agile project management in any area of his organisation. Reflecting on participatory approaches in his division, he explains that in the last two or three years they have been experimenting with organisational forms inspired by Laloux' (2014) organisational theory. This theory helped him to reorganise the service delivery of his division in that it allowed him to form flexible teams with variable competences that at the same time have clear objectives with respect to the services to be delivered. By reducing top-down project controlling and fostering

autonomy and responsibility with respect to the opportunities to cooperate he aimed at an improvement of service orientation, productivity and customer satisfaction. Also in this case the purpose of introducing participatory methods seems to be to better organise the second fundamental type of complex interface, i.e. to foster cooperation across departments on the basis of a more comprehensive understanding of the process by the single persons or departments involved. By that, different ways of interacting and knowledge management should unify and expand their productive potential. The reduction of vertical control should open up explorative spaces of doing things together.

4. Conclusion

In this paper, we addressed the problem of participation by asking how organisations deal with the steadily increasing technological and process complexity and a higher heterogeneity of the human beings involved. All these factors raise the uncertainty of everyday interaction within and beyond organisations and prompt the question if participation can make a useful contribution to organisational development. Processes of participation may be appropriate to foster innovation and are introduced in order to generate new ideas and to enable people to think outside the box, but they also go along with a possible loss of control and efficiency. Management has therefore still an important role in the co-designing of these processes with the people involved.

By accomplishing a qualitative content analysis of a series of interviews with IT and process managers, we worked out three fundamental types of "interfaces of complexity", i.e. passages in which technological evolution and organisational culture are intertwined and open up the question how to further develop the organisation, its processes and structures as well as its culture. While the first type of interface challenges strategy by raising the question which competences, which knowledge and which persons should assemble in order to organise non-hierarchical forms (Hardt and Negri, 2017) of strategic development, the second type of interface challenges intra-organisational cooperation by raising the question which type of executive style is to be established in order to enable autonomy and cooperative attitudes within and between teams and departments. The third type of interface challenges the distinction between specialised departments as well as the distinction between the organisation and its environment by raising the question how the logic of specialised cooperation can be overcome in favour of the establishing of a more comprehensive view that enables the people involved to create a common understanding and to integrate views, stakes and needs from "outside", be it another department, be it the customer.

Although some of the managers interviewed by us refer to popular recent approaches in organisational development like that of Laloux, to forms of innovation management imported from Silicon Valley or to methods like nonviolent communication and sociocracy (Rüther, 2018), they are all aware that they have to accomplish a thorough work of implementing these approaches, structures and methods in their respective organisational culture. As we initially stated, one cannot successfully implement new digital technologies or new organisational methods without translating these impulses into the respective culture, understood as the everyday informal cooperating routines and expectations (Kühl, 2018), as the way in which things are done together. This is why we decided to take a closer look on the "interfaces of complexity". These interfaces, these points or surfaces of intersection, open up explorative spaces that enable an organisational culture to grow, to develop, to react to formal changes such as the introduction of new methods, processes or technologies. Uncertain and ambiguous by nature, interfaces of complexity do not guarantee a successful transformation. Yet—as actor-network-theory suggests—by connecting people, problems, technologies and objects, they open up an intersubjective and interobjective horizon for profound change.

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