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13 Diversity in Scientific Communities: The Case of European-Japanese Cooperation at Fusion for Energy

Diversity enhances productivity. Since studies have shown this positive effect of diversity, plenty of manuals have been published which point to the allegedly "best" ways of managing cultural diversity in companies and public institutions (e.g. Konrad et al., 2006; Klarsfeld, 2010; Plummer, 2002). Despite the high number of publications on this topic, less attention has been devoted to the diversity which characterizes scientific and academic environments in particular. Although the development of science relies on mobility and exchange, the belief in the objectivity and impartiality of scientific results, the use of English as a professional *lingua franca*, and the convergence of resources (know-how, money, scientists) into big projects, might all distract from the specific differentiation which characterizes the scientific environment. In fact, scientists from different cultural and professional backgrounds develop their work by cooperating in a variety of laboratories and research centres spread throughout different countries. They share knowledge and techniques by negotiating concepts, norms and approaches developed in various contexts. The shared *lingua franca* consists more appropriately of a shared technical jargon, whereas the "global language", just like any other global resource, is appropriated and used very differently by the speakers (Blommaert, 2010). Science is affected by political, economic, social and environmental change, as well as by power (e.g. that of different interests competing in the development of specific scientific subjects), all fields of which are characterized by negotiations from the local to the national up to the transnational and global scale. In addition, science relies not only on scientific standards, but also on administrative and legal frameworks. As a result, scientific knowledge and what is generically addressed as "scientific culture" in the singular, reveal, after thoroughgoing analysis, a wide spectrum of diversities, all of which contribute, albeit in variable degrees, to the success of the whole scientific enterprise. Nevertheless, this has not been in the focus of the attention while looking at diversity in science, which is more commonly associated with the lack of representation of specific social groups (e.g. women, ethnic minorities, differently able people, etc.) and with the need of developing targeted strategies in order to increase their participation in the community. This is, of course, an important task in promoting access to educational and scientific institutions, which is a necessary prerequisite to address white male privilege in structures of power and in the production of knowledge.

This chapter, however, does not stake a claim to offer an exhaustive picture of this complex issue, which would deserve a far more extensive undertaking, but rather proposes to examine the phenomenon of (trans)cultural exchange in a particular scientific environment, which is that of the European-Japanese cooperation within Broader Fusion Development. With this purpose in mind, here are some initial

observations about the impact of different scientific cultures on transnational cooperation that have been developed by integrating a cultural studies scholarly perspective on this topic, and the perspective of scientists experiencing it in everyday life. This chapter originates from a dialogical exchange which began with an interview with Dr. Pietro Barabaschi (P. Barabaschi, personal communication, January 15, 2018), who is Head of Department at Fusion for Energy and Director of the European-Japanese Broader Approach activities. These activities have been initiated in the context of negotiations related to the nuclear fusion research megaproject ITER (https://www.iter.org/). During the ITER negotiations, the decision to site ITER in Cadarache (in the south of France) was reached in 2005 through an agreement between Europe and Japan on a privileged partnership in the ITER project[241] and in a set of activities, to be performed jointly in Japan—the Broader Approach Activities (BA Activities) (BA, n.d.). The agreed joint programme consists of three projects, the Engineering Validation and Engineering Design Activities for the International Fusion Materials Irradiation Facility (IFMIF/EVEDA, n.d.), the International Fusion Energy Research Centre (IFERC, n.d.), and the Satellite Tokamak[242] Programme (STP) Project JT-60SA (n.d.), the last of which will be the particular object of analysis in this chapter.

The reason for choosing this project relies on the particularly successful cooperation between the partners, which has been understood, also in the context of evaluation processes, to relate to the ability of the work-team in constructively integrating differences in approaches and frameworks. The main challenge in managing multicultural teams effectively has been located in recognizing underlying cultural causes of conflict and intervening in ways that solve the current problem and empower the team members to deal with future challenges themselves (Brett et al., 2019). In the interview with Dr. Barabaschi, which we have jointly planned and conducted, we have focused on the construction of a shared project identity and (trans)culture as a fundamental goal of the JT-60SA project, beside the goal of the construction of the tokamak itself (P. Barabaschi, personal communication, January, 15, 2018). Thus, instead of adopting a normative concept of diversity (understood abstractly), as is frequently used in addressing diversity issues (see section on JT-60SA), we have adopted a constructivist approach by investigating the different scientific cultures within the European-Japanese community engaged in the construction of JT-60SA. Moreover, we highlight how diversity has influenced ways of working and negotiating norms and practices of the community, and how this has affected achieving the expected results by staying within the budget and respecting the deadlines.

241 The intriguing story of the ITER negotiations is summarized at the Website (ITER, n.d.).

242 A tokamak is a thermonuclear fusion device which uses a powerful magnetic field to confine a hot plasma in the shape of a torus. The tokamak is one of several types of magnetic confinement devices which are being developed to produce controlled fusion. ITER and JT-60SA are both tokamak and the tokamak configuration is, as of today, the leading candidate for a practical fusion reactor.

Before examining the case of JT-60SA in greater depth, we will first critically examine, in the next section, the most common representations of diversity in the field of science, with a particular focus on diversity management.

13.1 Diversity in the Scientific Community: A Critical Review

In the introduction to the volume "Diversity in the scientific community", the editors Nelson and Cheng start by quoting a Business Dictionary, which defines diversity as being a "feature of a mixed workforce that provides a wide range of abilities, experience, knowledge, and strengths due to its heterogeneity in age, background, ethnicity, physical abilities, political and religious beliefs, sex, and other attributes" (Business Dictionary, n.d., as cited in Nelson & Cheng, 2018a, p. 1). By illustrating the advantages of diversity at the workplace, they refer to the report "Diversity Matters" (Hunt et al., 2015), which summarizes the results of the work conducted by Mc Kinsey & Company on the impact of diversity on the financial performance of 366 public companies in Canada, Latin America, the United Kingdom and the United States, and which testify an overall positive impact of ethnic, racial and gender diversity. By extending the considerations of the report from business and industry to the academic and scientific contexts, with a particular focus upon Science, Technology, Engineering and Mathematics (STEM) organizations, Nelson and Cheng indicate a variety of advantages brought about by diversity, such as the availability of differentiated competences in teams, a higher degree of creativity in finding effective solutions for problems, and a network of global connections guaranteeing accessibility to various resources (2018a, p. 3). A particular emphasis is dedicated to the benefits of diversity with respect to impact factors and citations, as has been highlighted by a number of studies to which the authors refer. For example, Smith, Weinberger, Bruna, and Allesina point out that the papers with authors "*from more countries* [emphasis added] fared better in journal placement and citation performance" (2014, as cited in Nelson & Cheng, 2018a, p. 3). In addition, statistics quoted by Freeman and Wei indicate that articles co-authored by "*scholars of similar ethnicity* [emphasis added]" tend to be published in lower-impact journals with fewer citations (2015, as cited in Nelson & Cheng, 2018a, p. 3). Thus, these studies indicate the ethnic identity of authors and their location in different countries as being responsible for a stronger impact of results on the scientific community. However, despite such positive results both in the scientific and business sectors, diversity is still considered to be a work in progress. One of the greatest challenges in this regard is seen in the "difficulty of managing diversity effectively" (Nelson & Cheng, 2018a, p. 3).

Page, who has researched issues of diversity in organizations by applying mathematical models (Page, 2007; 2011; 2017), speaks in one of his latest books of a "diversity bonus", which refers to the cognitive advantages that characterize heterogeneous teams working on high-dimensional, complex tasks, such as, for example, scientific

research. Page's study contradicts one of the most common critiques of diversity politics, namely that they hinder meritocracy, for example by prioritizing, in hiring processes, candidates' gender, ethnicity or socioeconomic backgrounds over their ability[243]. He claims, on the contrary, that "a policy of hiring the best does not make sense on high-dimensional tasks", since the best team will not consist of the "best" individuals but rather of a range of diverse thinkers (Page, 2017, p. 13). However, he also warns against simplistic expectations:

> Diversity cannot be arbitrary. The space of possible diversities is enormous. We cannot convene a random collection of diverse people and expect diversity bonuses. We need theoretical understandings of whether and how diversity can produce benefit on particular tasks. We need to make reasoned judgements about what type of diversity might be germane to the task at hand. (Page, 2017, p. 2)

By referring to the enormous "space of possible diversities", Page's (2017) model is grounded on a plural conceptualization of diversity, in which diversity is not regarded as an absolute quality, that is definable once and for ever, but is rather considered with respect to the changeable contexts and to the respective tasks that need to be achieved. The potential of diverse teams relies, in his theory, on the variety of the *cognitive repertoires* available in the whole group. Cognitive repertoires consist of information, knowledge, heuristic tools, representations, mental models and frameworks (Page, 2017, pp. 52–67). In order to achieve complex tasks, a working group should be able to rely on the highest possible range of cognitive repertoires relevant for the goal which is being pursued. Differences in identity features, such as age, gender, religion, race, etc., are seen as contributing to, but are not themselves constitutive of, cognitive diversity. This approach allows Page to overcome a quite common, static conceptualization of diversity, whereby diversity is conceived as the sum of isolated features such as gender, ethnicity, race, age, etc. Promoting diversity is seen, from this perspective, as enhancing the participation of underrepresented minorities in the corresponding majority-dominated contexts. In the scientific context, this means, for instance, increasing the number of women and differently able people who are operative in the community. This is the aim, indeed, of numerous diversity programmes and working groups, a good number of which are examined in detail by Nelson and Cheng (2018b). One of the problems with such an understanding of promoting diversity is that conceptualizing diversity as a mere sum of single identity groups can generate controversies in developing and evaluating efficient strategies for promoting

243 The widespread belief that ability or merit can be impartially defined would deserve a critical discussion of its own. Which abilities, or which candidates are considered to be "the best ones", always depends on the context and on the agency of specific traditions and power structures. For a critical discussion of meritocracy as a means of legitimation for neoliberal culture (e.g. white male privilege) s. Littler (2018).

it. This is the case, for instance, when a diversity programme that targets women is not considered to enhance diversity because it disadvantages people with disabilities or ethnic minorities. Similarly, statistics quoted by Dobbin and Kalev (2019) demonstrate that college recruitment programmes targeting women benefit Asian men more than Asian or Hispanic women; mentoring programmes do not benefit white women but instead Asian men. Even if the authors refer to such programmes as good practices, not everybody agrees. A reader's comment, for example, rightly points out: "It does seem that many of these purportedly successful diversity strategies simply expand the categories of men that men in power identify with" (O´Connor, as cited in Dobbin and Kalev, 2019)[244].

By considering such disputes from a transcultural perspective, it becomes evident that reasoning in terms of monolithic identities, and thereby conceiving diversity as the sum of single identity groups, can drive one's approaches to the absurd consequence that programmes intending to promote diversity end up being trapped in a quite homogeneous idea of it. Moreover, it has been demonstrated that conceptualizing diversity simply in terms of identity groups, and handling it accordingly, inhibits effectiveness in a wide range of organizations (Thomas & Ely, 2019). As a result, the need for a change of paradigm in addressing diversity has been voiced, by considering diversity with respect to the different perspectives and approaches to work brought by members of different identity groups. Such a proposed "integration paradigm" transcends both paradigms of assimilation ("we are all the same") and of differentiation ("we celebrate differences"), respectively, by connecting the role of real diversity to the "actual doing of work" (Thomas & Ely, 2019). Moreover, an intersectional-analytical approach, focused on "the intersections within and between the constructions of identity and commonality as well as the lines of difference and otherness", has been indicated as a possible way of escaping a normative approach to diversity, resulting as it does in unwanted hierarchizations of minorities (Kaufmann, 2016, pp. 121–143). Such a change of paradigm appears particularly significant in considering that research in managing diversity has been focused far more on *managing* rather than on *diversity,* insofar as it has investigated strategies for efficiently handling diversity but has not sufficiently questioned the concepts and practices on which it is ultimately based (cf. Ashcraft, 2011). It is not uncommon that reasoning about diversity starts with clarifications derived from dictionaries. Moreover, since dictionaries report the common meaning of terms, hegemonic ideas of diversity remain unquestioned and becomes recycled, facilitating, among other aspects, unintended consequences, such as a competition between the logic of enhancing productivity and the logic of increasing representativeness, a competition between single minorities, or controversies in evaluating programmes. The risk of perpetrating stereotypes and weakening the

244 Both the chapter and the respective, quoted comment on it are available online at the Harvard Business Review´s Website (Dobbin & Kalev, 2019).

action of valuable initiatives is not to be underestimated. Paradoxically, it has been noticed that the most successful strategies for enhancing the representativeness of minorities in companies are those which do not explicitly mention diversity, such as mentoring, cross-training and self-managed teams (Dobbin & Kalev, 2019, pp. 12–13, table).

Deeper inter- and transdisciplinary research is needed about diversity both as a concept and as a practice. Interrelating both perspectives of research in the social sciences and humanities, with a primary thematic focus upon diversity[245], and of research on managing diversity, which is primarily focused upon managing, can contribute to a better understanding of diversity in *specific contexts* and life-worlds, thus avoiding generalizing and essentializing socio-cultural categories. Research across the humanities and the social sciences has shown, indeed, that identity is a fluid category, which is constantly subjected to processes of negotiation. Halford and Leonard (2006) showed how social identities in the workplace are constructed not only by features such as class, gender and age, but also by contextual variables depending on space and place. Yet this is not to diminish the value of actions which are aimed at increasing the participation of underrepresented categories in the scientific environment. As pointed out by Gibbs (2014) in a blog post published on the Scientific American, diversity in science refers to "cultivating talent, and promoting the full inclusion of excellence across the social spectrum". ("What is diversity?" para. 4). In his view, "the large and persistent underrepresentation of certain social groups from the enterprise represents the loss of talent" (Gibbs, 2014, "Lack of diversity represents a loss of talent", para. 2). Yet increasing the pool of talent represents the prerequisite and not the outcome of the "full inclusion of excellence".

The creation of "inclusive cultures" is also considered by Page (2017) as the key aspect to making diversity succeed:

> Here, what I mean by an inclusive culture is one in which people have the ability to apply their full repertoires. A lack of inclusion means that someone feels that she has something to add and does not or cannot. (p. 221)

However, because of the changeable contexts and the wide range of possible tasks which require completion, there cannot be a "one-size-fits-all" solution.

245 Beside Page, other scholars like Hewlett, Marshall, and Sherbin (2013), Jehn, Northcroft, and Neale (1999) as well as Ross and Malveux (2013) have researched the nature of cognitive diversity and its impact on team performances, by distinguishing between *acquired* and *inherent* diversity, *identity* and *informational* diversity, *personality* and *behavioural* diversity (Hewlett et al., 2013 and Jehn et al., 1999, as cited in Page, 2017, pp. 53–54). Despite terminological asymmetries and respective differences in accentuating particular aspects of diversity over others, all these approaches share a dynamical conceptualization of diversity, which result from the interrelation between individuals and society.

Against this background, we will explore in the next section the case of the scientific community of Broader Fusion Development in the JT-60SA project, which is a part of Fusion for Energy. We will focus on the building process of a project-specific (trans) culture from the multiple diversities that characterize this scientific work, taking into account the input from recent advances in organizational studies, and intertwining them with the perspective of Transcultural Studies. Moreover, we will look into the dynamics of cooperation in JT-60SA by adopting the concept of "community of practice" (Lave & Wenger, 1991) and the corresponding framework of analysis developed by Wenger. A community of practice is defined as the result of a collective learning process developed by its members through both the pursuit of a common enterprise and its attendant social relations (Wenger, 1998, p. 45). Wenger's model stresses three main dimensions in which practice transforms a group of people into a community:

1. Mutual engagement;
2. A joint enterprise and
3. A shared repertoire.

Looking at JT-60SA as a "community of practice" hence allows us to highlight the social process of constructing a team by paying attention, simultaneously, to the personal and interpersonal engagements, the material-instrumental work carried on by the group, and the specific scientific context.

13.2 JT-60SA as a Transcultural "Community of Practice"

When we met Dr. Barabaschi for the interview, it became immediately clear to us that the JT-60SA project could not be described by only referring to the construction of the tokamak reactor in Japan. As a matter of fact, the story of the project can only be written by interweaving the progress which is attained in constructing the reactor with the development of a group project identity and culture. Without an *ad hoc* engagement in the development of such a (trans)culture, the construction of the reactor would not have advanced at such a quick pace. Working jointly on the construction of the reactor has represented the strongest glue for the scientific community cooperating in it, so that both of these processes have permeated and enriched each other. Therefore, both of them (constructing the reactor and constructing the team) shall be considered, by referring to Wenger's model, as a "joint enterprise" of the JT-60SA community.

As Wenger (1998) pointed out, a common goal is a fundamental glue of the community, but this "is not just a stated goal, but creates among participants relations of mutual accountability that become an integral part of the practice" (p. 78). In the following paragraphs, we will explain how both the "mutual engagement" of the community members and the development of a "shared repertoire" has contributed decisively to the scientific cooperation, and how diversity has influenced both processes.

Differences not only in attitudes towards hierarchies and authority, but also in communicating directly or indirectly (e.g. explicitly addressing problems or asking questions), as well as asymmetries in the use of the *lingua franca*, are considered to be among the most common challenges in managing multicultural teams (Brett et al., 2019). However, although cultural categories such as "European" vs. "Japanese", "Western" vs. "Easterners", "French" vs. "Italian" are most commonly addressed as responsible for cultural discrepancies, such categorizations might distract from other, more subtle, distinctions, which expand the range of diversities in the corresponding contexts. In the case of JT-60SA, Dr. Barabaschi (personal communication, January 15, 2018) mentioned at least 10 different "laboratory cultures" engaged in the project, of which 5 were particularly significant with respect to their impact on the project activities. These include: National Institutes for Quantum and Radiological Science and Technology (QST, Japan), National Institute for Fusion Science (NIFS, Japan), Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA, France), Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT, Spain), Consorzio RFX, Padova (Italy), Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (ENEA , Italy), Karlsruhe Institute of Technology (KIT, Germany), Studiecentrum voor Kernenergie - Centre d'Etude de l'Energie Nucléaire (SCK-CEN, Belgium), Joint European Torus (JET, UK), Max Planck Insitut für Plasmaphysik (IPP, Germany).

The diversity of such "laboratory cultures" manifests itself in practices which are fundamental to the development of the project, such as decision-making processes, ways of structuring meetings, and the criteria determining the order of mentioning co-authors in joint publications. Conflicting norms for decision-making can cause delays, thus slowing down the activity of the whole team. This is the case, for example, when a task which is commonly discussed and approved by community members in the context of a meeting is considered to have been definitively approved only by some of them, and put back to the final approval of absent supervisors by others. The reasons for such misunderstandings may rely in differences in handling hierarchies (e.g. prevalence of horizontal vs. vertical communication) or in a different use of English as the *lingua franca* (e.g. does "yes" signalize approval, agreement or only a willingness to further considering the issue?). Even if these differences might also be influenced by socio-cultural norms subsumable under categories such as "Japanese" or "Italian", such influences are only partial, and they intertwine with the "laboratory cultures". Particularly in scientific communities, whose members are used to moving among international centres and institutions spread all over the world, addressing the national or ethnic identity—even assuming that it would be clearly definable—as the only factor responsible for such misunderstandings would not only be mistaken, but would also strengthen stereotyping within the community, thus jeopardizing an efficient and collaborative cooperation.

The negotiation of norms regulating collective work processes has, therefore, been particularly important for the effective development of the project. This has resulted,

among other aspects, in the creation of a shared documentation management system, which is accessible by all the partners and subjected to a set of agreed norms. Cooperating on it jointly has not only smoothened collective work processes, but has also contributed to strengthen the project identity, thus having positive effects in turn on both aspects of the "joint enterprise". The creation of a shared documentation management system can be seen as one of the most significant elements constituting the "shared repertoire" developed by the community. Wenger (1998) stresses that

> the elements of the repertoire can be very heterogeneous. They gain their coherence not in and of themselves as specific activities, symbols, or artefacts, but from the fact that they belong to the practice of a community pursuing an enterprise. The repertoire of a community of practice includes routines, words, tools, ways of doing things, stories, gestures, symbols, genres, actions, or concepts that the community has produced or adopted in the course of its existence, and which have become part of its practice. The repertoire combines both reificative and participative aspects. It includes the discourse by which members create meaningful statements about the world, as well as the styles by which they express their forms of membership and their identities as members. (pp. 82–83)[246]

Another significant element of the shared repertoire can be physically observed by accessing the entrance hall of the building in which the European Home Team of JT-60SA is located in Germany, at the Max-Planck-Institute for Plasma Physics in Garching. Here, a monitor—which can be considered a reification of the cooperation—shows in real time the advances in the construction of the actual research infrastructure in Japan, 100 km north from Tokyo. By "materializing" the intellectual work of the scientists into the very body of the reactor and making it visible for staff members, guests and visitors, the images not only motivate the team, but also connect, virtually, the community spread across different places and time zones, into a shared spatial-temporal simultaneity.[247] It would be valuable to explore in further depth the impact which this practice has on the life-world of the community, for example by collecting

246 Wenger (1998) refers to both reification and participation as the main aspects of negotiating meaning in a community (pp. 51–71). By participation, he stresses that the engagement in a community of practice implies more than mere doing. It transforms the individuals taking part in the "joint enterprise", who, in turn, transform the community. Participation does not mean in any case a collaborative relationship: "A community of practice is neither a haven of togetherness nor an island of intimacy insulated from political and social relations. Disagreement, challenges, and competition can all be forms of participation" (Wenger, 1998, p. 77). Reification, on the other hand, is understood as "the process of giving form to our experience by producing objects that congeal this experience into 'thingness'. In so doing we create points of focus around which the negotiation of meaning becomes organized" (Wenger, 1998, p. 58).

247 Sociological inquiry, such as research carried out in the context of actor-network-theory, has pointed out the agency of material objects (Latour, 2005). Gaupp's chapter on "Epistemologies of Diversity" in this volume considers this topic in further detail.

and analysing data about social routines and speeches that take place in front of and around the monitor.

Other examples of reification are gadgets, such as pens and tags, which display the name of the project, and the logo, which is shown in scientific presentations and events. These artefacts, employed in everyday practices, are not only a symbol of identity for the group members, but also construct a boundary between the JT-60SA community and other teams, such as those engaged in the other projects of the Broader Approach at Fusion for Energy. The logo and the gadgets contribute, in this context, to strengthening the feeling of belonging to the community, and to stimulate, at the same time, a process of "othering" towards out-groups, which might function as an additional competitive motivation in achieving results. A strategy of differentiation is thus a significant part of the development of the group identity. However, this does not mean that the cohesion of the community is linked to an idea of inner homogeneity. On the contrary, as stressed by Wenger (1998),

> [...] each participant in a community of practice finds a unique place and gains a unique identity, which is both further integrated and further defined in the course of engagement in practice. These identities become interlocked and articulated with one another through mutual engagement, but they do not fuse. Mutual relations of engagement are as likely to give rise to differentiation as to homogenization. Crucially, therefore, homogeneity is neither a requirement for, nor the result of, the development of a community of practice. (pp. 75–76)

Mutual engagement is also considered by Dr. Barabaschi (personal communication, January 15, 2018) to be a fundamental prerequisite for effective cooperation, because, among other aspects, it helps to reduce bureaucracy, thus speeding up work processes. In order to develop and strengthen mutual accountability and trust, the size of the team is of great importance. Big projects counting thousands of scientists are subjected to more complicated bureaucratic structures, which hinder scientific progress. In addition, in particularly politicized fields of research, such as the nuclear field, politics and change may dramatically influence the work progress of big projects.[248] Furthermore,

248 The political influence on big scientific projects may take various shapes, as in the following examples:

1. Decision by specific governments to suspend funding for a project, as in the case of the retirement of the United States from the nuclear fusion research megaproject ITER in 1998, later reversed in 2005 when the US rejoined ITER;
2. Big projects might have a symbolic political meaning which is not directly linked to scientific issues (e.g. celebrating the cooperation between two or more countries which have recently settled terms of peace with one another). In these cases, scientists may encounter political resistance whenever they see a need for changing strategies or approaches. In other words, the scientific reasons might clash against political ones;
3. The leadership of big scientific projects may be set by following political, instead of scientific reasons, thus compromising the project performance;

proper team size allows members to get to know each other personally and to develop relationships of mutual accountability. In this regard, the JT-60SA community, which numbers around 400 members of which approximately half are based in Europe and half in Japan, is considered to have an adequate size. To what extent mutual trust and accountability have contributed to achieving the expected results by staying within the budget and respecting deadlines is shown in the following examples: since the technical planning, design and assembly of the reactor is split between Europe and Japan, regulation in contracting, and standards in designing may differ to some degree. Sometimes technical drawings realized in Europe are constructed by Japanese companies and in compliance with Japanese regulations. The Japanese contracting and procurement section of the project uses Japanese for important documents such as technical specifications of supply contracts. As a result, developing personal relations of trust with the Japanese colleagues who follow the contracts has allowed European partners to save much time in translating any details while concluding the contracts. Mutual trust is also important when something goes wrong. This has been the case, for instance, in the context of planning and constructing a connection of the cryogenic plant (which involves the providing of cryogenic Helium to the device superconducting magnet). Since the sight orientation in technical drawing differs between Japan and Europe, working jointly in designing and planning requires a process of "graphic translation", which specifies, for example, whether the section of an object follows the Japanese or the European orientation standard, so that the corresponding object can be constructed accordingly. This common proceeding is marked by a code, which, if omitted in the planning or overseen in the constructing process, prevents the "graphic translation". Because of such oversight, it happened that a component, which had been designed in Europe, did not match with the complementary part built in Japan. The costs deriving from this mistake were in the tens of thousands of euros. In such cases, relationships of mutual trust and accountability help colleagues to take collective responsibility instead of accusing each other, which would cost, according to a longer perspective, much more, since the weakening of mutual engagement would increase bureaucracy and slow down work progress. Moreover, the chance of community members to give and receive support is also fundamental with respect to scientific progress. The work of "community maintenance" is considered by Wenger (1998) as an intrinsic part of any practice (p. 74). As such, this aspect would be worth considered also as a part of the scientific work.

4. Political decisions may follow quick reactions to current events and produce sudden changes in specific scientific developments (Barabaschi, personal communication, January 15, 2018).

13.3 Concluding Remarks: Perspectives and Further Developments

The chapter has offered a concrete example of how transnational cooperation in scientific environments can be analysed with respect to the formation of transcultural communities rather than with respect to the sum of single identity groups. Although reasoning in terms of monolithic identities still remains dominant in common discourses and practices focused on diversity—including strategies aiming at promoting it—advances in organizational studies have pointed out the need for a change of paradigm, in which diversity is understood as a solution, instead of a problem, for approaching complex tasks and optimizing results (Page, 2017; Thomas & Ely, 2019). The case of scientific communities appears particularly interesting in this regard, because of the specific patterns of mobility that characterize scientific resources (human, economic, cultural), which generate a wide range of diversities influencing the development of science. The impact of diversity—in such a plural conceptualization—on work processes has been, so far, widely under-explored, especially if compared with the numerous studies focused on managing diversity in the business sector, which, in a neoliberal vein, focus exclusively on productivity.

This chapter has pinpointed this gap by stressing the potential of interweaving recent advances in management and organizational studies—proposing a more dynamical look at diversity than that based on single identity groups—with analytical frameworks of social and cultural studies. This would imply critically deconstructing static representations of diversity in society and at grasping the socio-cultural, political and economic dimensions of cooperation in a scientific environment. These first insights into the JT-60SA community have highlighted, indeed, the strong nexus between the socio-cultural dimension of scientific cooperation and its respective outcomes. Moreover, they have stressed the significance of considering such a nexus in managing and developing science, by showing the positive impact of specific strategies on the project's results.

Against this background, much work still has to be done in order to analyse in greater depth the influence of diversity on the development of science. In this regard, examining more elements of the shared repertoire of scientific communities and further investigating the forms of mutual engagement and their impact on pursuing the respective joint enterprise would both help to provide a more detailed picture. Moreover, analysing the dynamic of appropriating and negotiating technical and cultural resources (e.g. application of scientific skills, use of English as a *lingua franca*) by single scientists, and relating it to the development of the work within the community, would contribute to investigating the articulation between the local and the global, in doing science, at different scales (e.g. in a single laboratory, a big project, and in a global scientific community). In addition, analysing relationships of cooperation and competition between different teams would offer valuable examples for examining the process of "doing identity" (Hall, 1992) within a community, and the related process of "othering" with respect to other communities. With respect to the communication and the

negotiation of differences, conflicts and misunderstandings are rich sources worthy of investigation. Moreover, collecting and comparing (auto)biographical narratives of scientists who have "migrated" through different laboratories and centres, would contribute to a better understanding of the multiple diversities within the so-called "scientific culture". All in all, further inter- and transdisciplinary research on diversity in scientific communities would contribute to expanding the concept of culture with respect to the scientific environment, linking socio-cultural realities to the practising of science and, consequently, developing a stronger awareness of culture in scientific management.

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