

WORKING PAPER 4
WORKPACKAGE 4



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1. WORKING PAPER No. 4: A TARGETED USE OF RESEARCH QUESTIONS

Working Paper No. 4 represented, for all the teams in the project, a slight departure from earlier work, although this holds for some teams more than for others. As will become clear in the following paragraphs, this diversity of situations applies to Work Package 4 (hereafter: “WP4”). Before turning to the respective working papers of the three teams belonging to WP4, we briefly characterise how each team went about addressing the notions of “creativity” and “innovation”, and how these can be related to their specific research tasks.

2. RT4.1: EFFICIENCY AND FAIRNESS

Given the objectives of RT4.1, addressing notions like creativity and innovation was in fact quite natural — largely because in many ways, this RT is particularly close to the core objectives of the DYLAN project as a whole. Let us recall that a central goal of the DYLAN project is to identify the conditions under which multilingualism, rather than a cost or a hindrance, can actually be a benefit for society as a whole. It stands to reason that one of these benefits could be enhanced creativity and innovation — the challenge then being to show that creativity and innovation, or at least prospects for creativity and innovation, are better in a multilingual context, or when social actors go about communicating among themselves in a multilingual fashion.

This fits in well with RT4.1’s research topic, particularly with respect to “efficiency”. Let us recall that for the purposes of this research, and for reasons amply explained in Working Paper No. 1, we interpret “efficiency” as “cost-effectiveness”. It follows that if multilingual practices can be shown, all other things being equal, to improve creativity and stimulate innovation, then multilingualism contributes to efficiency; creativity and innovation would then be viewed as conduits through which this effect occurs. To address this point, the RT4.1 research team has looked at literature in theoretical and empirical psychology, where creativity has been an important topic for decades, and

where interest in the link between creativity and multilingualism has recently emerged.

In RT4.1's work, however, a distinction is made between "creativity" (as the core phenomenon at stake) and "innovation" (its application to specific procedures, often in the productive sphere). The choice made in this Working Paper has been to focus on the deeper notion of creativity. A formal structural model is presented, proposing a set of explicit relationships that lend themselves to quantitative estimation. The variables connected through these relationships may, in turn, be measured through indicators.

Interestingly, this approach dovetails with a recent report on multilingualism and creativity sponsored by the European Commission and published in the second half of 2009 (see references in the text).

3. RT4.2 EMERGENT VARIETIES

Owing to its focus on language corpus, RT4.2 addresses creativity in quite a different sense, namely, creativity in language behaviour. Creativity may then be reflected in the (possibly novel) ways in which actors use the linguistic resources at their disposal.

This approach generates a critique of "languages" as discrete, distinct entities, backed up by examples suggesting that in an "ELF situation" (that is, in situations where non-native speakers of English use English for communication); in so doing, they draw on a variety of linguistic resources. This is particularly in evidence in their exploitation of lexical resources.

This observation might, in turn, be expanded into a perspective on creativity that is closer to one outlined above. If actors demonstrate creativity in their linguistic choices, might they not also be, at the same time, more creative in other ways? On this view, non-native users of a language, because they are freer from the constraints of native usage, may also feel freer to behave "creatively".

4. RT4.3: MULTILINGUALISM IN EUROPEAN HISTORY

This RT has historical focus: it looks at ways in which, throughout European history, social actors have positioned themselves *vis-à-vis* linguistic diversity —

the goal also being to see how this has, in turn, influenced linguistic diversity itself.

Against this backdrop, the RT4.3 team has looked at creativity in a very specific way, focusing on scientific creativity in the 16th and 17th century. The team asks “why it was in Europe and in this period in history that scientific creativity gained such momentum. If we want to study linguistic diversity as a factor which is relevant to the emergence of creative products [...] we will first have to establish other factors which are possibly relevant to a rise of creativity. As a next step we can define the relationship between linguistic diversity and creativity within a broader set of factors which are relevant as conditions for creativity [...]”.

A case in point is 16th century cartography, when Dutch and Flemish cartographers were ahead of others in Europe. One possible explanation for this edge is that it is related to a better integration into a “network of scientists”, in which linguistic diversity may play a part: multilingualism enabled these cartographers to engage in encounters with other cultures and languages, gain knowledge from them and participate more actively in knowledge development in the context of this network.

1. Brief reminder of research task

RT4.1's research task is to develop a set of indicators that can serve to assess the relative efficiency and fairness of alternative ways of handling communication in multilingual settings. The core of the analytical apparatus of RT4.1 is provided by *policy analysis*, whose analytical foundations, in turn, are mainly located in mainstream economics. The concepts of efficiency and fairness constitute two of its essential building blocks.

2. Introduction

Efficiency is a conceptually elaborate notion that requires, in fundamental theory, the conjunction of three elements: efficient production, efficient consumption, and efficient product mix. For the purposes of this research, however, we are applying a slightly less demanding concept of efficiency, and we shall interpret it as roughly equivalent to the notion of "cost effectiveness". This interpretation, while significantly simplifying the use of the concept in our comparative assessment of communicational situations, preserves the core meaning of the concept of efficiency, namely, the idea that scarce resources (whether of the market or of the non-market kind, whether material or symbolic) are *allocated* wisely.

Fairness is a criterion that helps analysts assess alternative *allocations* of scarce resources in terms of the resulting *distribution* of resources among actors or groups of actors. Judging one particular distribution as "more fair" than another is, ultimately, a normative question to be approached through the intellectual instruments of the neighbouring discipline of normative political theory. However, policy analysis can pave the way for an examination of these normative aspects by rigorously establishing who gains, who loses, what, and how much, under alternative distributions of market and non-market resources.

Much of the work of RT4.1 is devoted to the adaptation of the policy analysis tools briefly sketched above in order to make them applicable to the study of

language use – more specifically, the comparative evaluation of more or less multilingual ways of handling communication in multilingual settings. These alternative ways can be rank-ordered as more or less efficient, or more or less fair; of course, a standard problem of trade-off between efficiency and fairness may arise. This approach implies that efficiency and fairness can be measured, even if only approximately; the information thus generated can then serve as an input for individual and collective choices, with implications for language policy, because it provides background for democratic debate.

The question then becomes one of how efficiency and fairness can be measured, and in terms of what variables, expressed in what units, these measurements can be made. An important part of RT4.1's work, therefore, is to design a consistent *system of indicators* that can put figures on the relative efficiency and fairness of different ways of coping with the challenges of communication in multilingual settings.

Let us point out that RT4.1's task is *not* to "populate" the system of indicators, that is, to put actual figures on them: this would only be possible following extensive gathering of quantitative data, presumably through the use of large-scale (and necessarily expensive) representative surveys. However, before engaging in any such survey, it is necessary to know what data should be collected, and for what reasons – and this is precisely the type of knowledge that RT4.1 is designed to produce.

Contrary to most of the RTs in the DYLAN project, is not terrain-oriented. The issue of creativity, therefore, would not be approached in terms of *observations* of higher or lower creativity in relation with different ways in which communication in multilingual settings may be handled. Rather, our question would be the following: are the links – if any – between multilingualism and efficiency and between multilingualism and fairness *mediated* through creativity and innovation? Or, putting it more directly, are there theoretical and empirical reasons to think that *more* multilingualism, *by enhancing creativity and innovation*, will result:

- in a more efficient allocation of scarce resources

and/or

- in a more equitable distribution of scarce resources

than *less* multilingualism would?

As we shall see in the following section, these questions can serve to generate a consistent investigative framework. However, as will quickly become apparent, any progress on this issue requires considerable effort in theoretical elaboration – particularly in terms of the clarification of the key variables – even before we can consider moving on to any kind of empirical work.

Let us also recall that “creativity” and “innovation” are fields of investigation in their own right (in which the pivotal discipline is psychology), and that we do not intend, in this working paper, to attempt any kind of contribution to the topic of “creativity”. Our concern, rather, is to see *how* the notion of creativity can be fitted into our pre-existing research questions. On this view, this particular Working Paper in the context of the DYLAN project has a decidedly exploratory character.

3. Analysis

3.1 Conceptualising creativity and innovation

The terms “creativity” and “innovation” are bandied about quite freely in political and media discourse; and much of scientific discourse also fails to identify their actual meaning properly. However, if any relationship between multilingualism on the one hand, creativity and innovation on the other hand, is to be established, a reasonably tight definition of all the concepts involved in this relationship is indispensable.

Let us first distinguish “creativity” from “innovation”. In this discussion, we shall focus on creativity, and largely leave innovation aside, with the understanding that innovation may *proceed* creativity, and constitute a possible *operationalisation* of it. Thus, innovation may follow manifestations of creativity, but it should not be expected to precede it or occur independently of it.

Even if we restrict our discussion to creativity, further clarification is needed, largely because the very notion of creativity, even in the discipline, psychology, that is most directly involved in its study, is not always straightforward. More specifically, the notion creativity appears to have become fragmented in possibly diverging interpretations, one of them implying a progressive drift towards a somewhat mundane, even commercialized notion popular in the

management and human resources literature. In the latter, creativity could turn out to mean little more than a worker's ability to produce outwards signs of thinking "laterally" or "out of the box", and to churn out ideas of procedures and products with immediate business applicability. Pending closer examination of the literature, we may suppose that we are then dealing less with creativity as an ability, or a proclivity, than with innovation as a materialization of it – as it were, *innovation*.

Hence, in what follows, we are referring to creativity in a narrower sense, often called *ideational* creativity or even *ideation*. Thus, creativity is essentially viewed, in this paper, as an ability, a trait, an inclination, and does not necessarily imply any form of materialization. What matters to us is the *possibility* of materialization.

3.2 Explaining creativity

Sternberg and Lubart (1999) review different concepts of creativity, a topic to which the research community (at least in the field of psychology) has started devoting sustained attention from 1950 onwards. Throughout the history of research, the focus of investigation seems to have been either what explains creativity (essentially, where it comes from), or the nature of creativity (what "counts" as creativity).

They first characterize a series of approaches to creativity as "mystical", "pragmatic", "psychodynamic", "psychometric", "cognitive", and "social-personality [oriented]". For lack of space (and also because this would exceed the goals of this working paper), we shall not discuss these alternative perspectives.³ However, the last of the set of approaches presented by Sternberg and Lubart, which they call "confluence approaches", probably provide the conceptual anchoring that we need. According to the confluence approach, "multiple components must converge for creativity to occur" (Sternberg and Lubart, 1999: 10). This includes cognitive and personality traits, motivation, domain-relevant knowledge and abilities, and creativity-relevant skills (which are in turn broken down in more finely defined abilities).

More explicitly systemic perspectives (congruent with this notion of convergence) have been developed, stressing the interaction between

³ These alternative approaches usually try to explain the sources of creativity. For example, the "mystical" approach interprets creativity as the product of divine intervention, for which the human actor appears to be mainly a vessel, or a conduit.

individual characteristics, the domain in which creativity may be exercised and measured (for example, music, literature, etc., though the authors define it more formally as a “culturally defined symbol system”), and the field, that is, people who “control and influence a domain” (*ibid.*).

An additional dimension of creativity, proposed by Sternberg and Lubart in earlier writing, is that of “investment”, and it is useful here to quote them more extensively: “creative people are ones who are willing and able to ‘buy low and sell high’ in the realm of ideas”. Putting it differently, creativity implies the ability to spot something that others tend to neglect, and make it valuable. This idea may provide a link to the issues of interest to this working paper, namely, whether a structural relation between multilingualism and creativity might exist.

In any event, we shall proceed on the assumption that creativity can be defined as “the ability to produce work that is novel and appropriate”, a view which Lubart (1999) presents as consistent with the Western perspective on creativity (because there could be others).

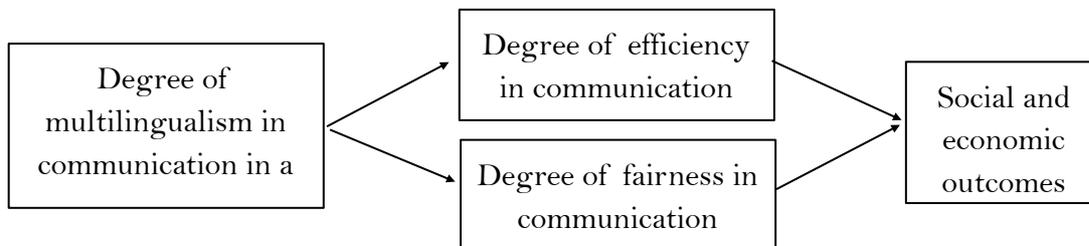
3.3 Defining creativity

As noted above, one important issue is what “counts” as creativity. Kaufman and Beghetto (2009) observe that in a survey of 90 psychological papers using the word “creativity” in their title, only 38% explicitly define it. However, it appears that research tends to focus either on “everyday creativity”, which can be found in nearly all people, and “eminent creativity”, that is, creative greatness that is the preserve of a few exceptional individuals. This dichotomy, however, leaves major gaps in the range of arguably creative manifestations that theory can account for. Thus, they suggest breaking down this range more finally, in order to accommodate not two, but four types of creativity: between “little c” (everyday creativity) and “big C” (eminent creativity), they propose allowing two slots for “mini-c”, that is, creativity associated with a learning process, and “Pro-c”, which is linked to the progress (not without effort) to professional-level expertise in any creative area. This is compatible with the definition of creativity that we shall henceforth be using: “Creativity is the interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context” (Plucker, Beghetto and Dow, 2004: 90).

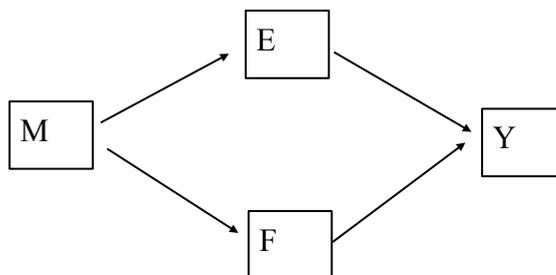
3.4 Towards a structural model

Although there exist structural models of creativity itself, building creativity into our approach implies fitting it in into a yet broader model which we may, at an initial stage, represent through a series of progressively more detailed diagrams, where an arrow from X to Y denotes the idea that “ X influences Y ”, under a standard *ceteris paribus* assumption. This approach implies epistemological choices, namely falsifiability and generalisability, implying that we are interested in producing falsifiable propositions with general validity (that is, not merely based on commentary on idiosyncratic observations).⁴

The basic model, which is centered on the concept of efficient and fair communication developed in RT4.1’s Working papers No. 1, 2 and 3, may be represented as a very simple diagram:



Or, in symbolic terms:



The “creativity-augmented” model is slightly more complex and it can be more crisply presented by starting with a set of four equations with 8 variables or sets of variables defined as follows:

- X1, X2, X3: three sets of exogenous variables
- C: creativity

⁴ We are aware of the debates surrounding these notions, and ours is simply an epistemological choice — which is, however, widely shared in the scientific community. Incidentally, it might be useful to quote the new *Law on the University* (of Geneva) passed by the Geneva Parliament on 13 June 2008: “The University is [...] dedicated to fundamental and applied research [...]. It operates in accordance with principles of objectivity, open discussion and falsifiability on which a rational intellectual approach is based.”

- E: degree of efficiency in communication⁵
 F: degree of fairness in communication⁶
 M: degree of multilingualism in communication⁷
 Y: social and economic outcomes

- (1) $Y = Y(E, F, C, X1)$
 (2) $E = E(M, C, X2)$
 (3) $F = F(M, C, X2)$
 (4) $C = C(M, X3)$

Let us stress the importance of referring to social and economic *outcomes*, since the question of the potential role of multilingualism in enhancing creativity, therefore, is particularly relevant precisely in these terms. As Marsh and Hill (2009: 23) note “we are at a period in history when innovation through creativity is viewed as a key driver for social and economic success”.

For example:

- equation (1): social and economic outcomes are a positive function (i) of creativity, (ii) of efficiency in communication; (iii) of fairness in communication; (iv) of other variables (symbolised by X1, which may include physical capital, quantity of labour, training level of labour, climate, etc.);
- equation (2): the degree of efficiency in communication will depend (positively) on creativity and a set of further variables (symbolised by X2) defining the communication process, but the effect of multilingualism on efficiency is a priori ambiguous;
- equation (3): the degree of fairness in communication will depend (positively) on creativity and further variables defining the communication process, but the effect of multilingualism on fairness is a priori ambiguous;
- equation (4): creativity will depend on a host of other variables symbolised by X3 (these variables are those that psychologists working on creativity analyse) but the effect of multilingualism on creativity is a priori ambiguous. As Marsh and Hill (2009: 5) note, “the available evidence

⁵ E.g. more or less cost-effective informative type of communication, or *a*-communication, in companies (cf. *Working Paper # 1* for definitions).

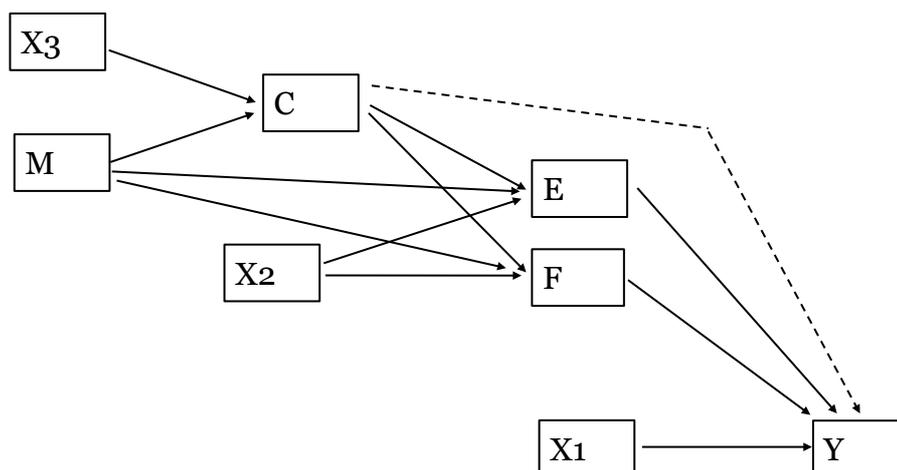
⁶ E.g. more or less equal distribution of costs between universities in having “access” to a common communication network (cf. *Working Paper # 1* for definitions).

⁷ E.g. use of more or less languages to different levels of competence in different domains, etc. (cf. *Working Paper # 1* for definitions).

supporting the notion that multilingualism is linked to creativity is equivocal, and subject to multiple interpretations”. However, studies carried out in this domain tend to show the emergence of several “evidence clusters”, pointing out that multilingualism can lead to specific forms or conditions which might be linked to creativity.⁸

The signs of all first-order derivatives of any variable V with respect to any variable W (noted V_W) among the variables listed above are assumed to be positive, except that the signs of C_M , E_M and F_M are a priori ambiguous (a set of questions which is, after all, at the heart of the entire DYLAN project). Our mission *in general* is to check under what conditions Y_M is positive, and in the context of RT 4.1, we break up the question and check whether C_M , E_M and F_M are positive, inferring from that under what conditions Y_M is positive.

The equation system above can be represented as a diagram:



Note that this structural model is not immediately testable, because of instances of multicollinearity — for example between M and C as determinants of E and F .⁹ An econometrically testable model would therefore be represented differently (and be referred to as a “reduced form”); at this point, we are interested in the basic structural model only.

Thus, if we ask ourselves whether multilingualism matters *in relation with creativity* as a determinant of socio-economic outcomes (which is how we

⁸ Marsh and Hill (2009: 6) report six major clusters, namely, “mental flexibility, problem solving capability, metalinguistic ability, learning capacity, interpersonal ability and, finally, the ageing process”.

⁹ Multicollinearity occurs when there is a linear relationship among some or all explanatory variables in a regression model. The econometrics literature (e.g. Stuart, 1984: 129) that “as long as none of the correlations between explanatory variables is particularly high, there is no difficulty associated with multicollinearity”. However, high correlations between explanatory variables (that is, having at least one correlation coefficient between explanatory variables close to one) may bias the estimations of the coefficients being investigated.

translate the core DYLAN question of “being an advantage or an obstacle”), we need to check (i) analytically, the signs of C_M , E_M , F_M , E_C , F_C ; (ii) empirically, the signs of the combined relationships that survive after rewriting of the equation system eliminates collinearities.

4. Discussion and provisional conclusion

It would not be reasonable to expect “results” before (i) a full-fledged analytical model has been developed; (ii) the analytical model has been transposed to a “calculable” – that is, statistically testable – form; (iii) suitable data (as identified thanks to the analytical model) have been gathered; and (iv) empirical testing has actually taken place with the data, generating (hopefully) statistically robust coefficients. It is possible that the qualitative work carried out in other RTs, though falling short of actually establishing a relationship between multilingualism and creativity, may provide some pointers that may be heuristically helpful when formulating hypotheses regarding how multilingualism and creativity may actually be related. At this point, of course, neither a full-fledged analytical model, nor appropriate data, nor conclusive empirical work, are available in the literature.

The foregoing, therefore, represents no more than a blueprint for a proper investigation, which may be undertaken in the wake of the DYLAN project (but is not foreseen in the project’s design as it stands). Let us however mention some of the essential steps that such an investigation should include:

1. the definition of an operational concept of (ideational) creativity (building e.g. on Kaufman and Beghetto, 2009);
2. the development of analytical assumptions connecting indicators of multilingualism with indicators of creativity—allowing for the dual treatment of multilingualism as an individual and a collective features, possibly operating through distinct, through not necessarily mutually independent, channels, and taking due account of the possibility of network externalities¹⁰. The identification of quantifiable indicators to test empirically this type of hypothesis is a promising research line. Let us note, for example, that a recent survey carried out on thirty of the most innovative European multinational companies shows that the majority of respondents

¹⁰ Network externalities occur when because of the nature of a particular commodity (language as a tool of communication being one example), the use of a commodity by an agent, instead of reducing the amount of the commodity available to others, or the value of another agent’s endowment in that commodity, actually increases the other agent’s endowment or the value of the latter. Addressing this point is central for proposing any dynamic account of the relationship between individual and societal multilingualism – and its implications for value creation.

have seen examples in their company suggesting that multilingual teams are better at solving complex problems and are more creative than others (Marsh and Hill, 2009: 21);

3. the development of analytical assumptions connecting creativity, through resource allocation, to some indicator of value creation, possibly through the productive process (Grin, Sfreddo and Vaillancourt, 2010). The parallel development of analytical assumptions connecting creativity, through resource distribution, to some indicator of value creation, should in principle be envisaged, although it is not clear to us, at the time of writing, what the corresponding narrative could be.

The foregoing, which establishes (in the reduced form) a direct link between multilingualism and creativity, assumes that the issue of network externalities has been somehow dealt with (see Dalmazzone, 1998; Grin, 2003).

Let us also mention, in relation with the second point, that some attempts have been made to design shortcuts, usually with respect to multilingualism as an individual (as opposed to collective or environmental) feature only (e.g. Simonton, 2008).¹¹ At this stage, they remain somewhat inconclusive (cf., for example, Marsh and Hill 2009)., or fail to address our question directly, since they use proxies on either side of the relationship discussed here.

On the one side, for example, Bialystok (2008) examines the relative speed of bilingual and unilingual in flanker tests, where speed is presented as an indicator cognitive and memory performance; it is unclear, however, to what extent such test results can be viewed as predictors of creativity; let us simply observe that creativity specialists do not use treat them as sources, let alone as expressions of creativity. On the other side, Maddux and Galinsky (2009) relate subjects' performance in standard creativity tasks with the experience of living abroad – certainly a rather distant proxy for second or foreign language skills.

The existence of these papers suggests that one challenge for future research is field demarcation, particularly in order to avoid getting sidetracked. For example, it is tempting to branch off into the related, but distinct question of the role of multilingualism in knowledge creation and transmission in groups. Although this is interesting, it becomes relevant to our investigation only if

¹¹ Early studies dating back to the 1960s explore the relationship between bilingualism and creativity (mediated through cognitive development) among immigrant children groups in the US.; these studies are, however, embedded in a dated perspective where the assumption that bilingualism could actually hamper cognitive development was readily made; see e.g. Janssen (1969).

knowledge creation and transmission is shown to be positively related to efficiency and/or fairness – and, through the latter variables, to desirable social and economic outcomes.

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1. Brief reminder of research task

Research task 4.2 'Emergent varieties' is concerned with the "investigation of the linguistic and communicative changes that affect English as a lingua franca under increasing interaction with other languages in multilingual practices" (Annex I, p. 35).

2. Introduction

The task of investigating manifestations of creativity in multilingual environments presents us with the challenge of defining the very elusive phenomena of creativity and innovation in the first place. The literature on this subject is highly diverse – no agreement seems to exist between the different disciplines on what can be subsumed under this concept. Quite frequently linguistic creativity is discussed in relation to poetic language usage, language play (cf. e.g. Maybin & Swann 2007; Pomerantz & Bell 2007) or just free experimenting with the language. For our research purposes, however, the following approach appears to be more suitable:

Creativity is not simply a matter of 'letting go'. It is sometimes assumed that creativity only emerges from 'free expression' and lack of inhibitions or constraints. This is very misleading. Freedom to experiment is essential for creativity. *But so too are skills, knowledge and understanding.* (*National Advisory Committee on Creative and Cultural Education* report 1999: 42, emphasis added)

In our view, the decisive statement here is that creativity always entails the knowledge of *something* that can subsequently be manipulated (intentionally or unintentionally). Or, in linguistic terms relevant for ELF research:

users will naturally draw on actualizations they have been exposed to, and instructed in. Where the creativity lies is in the manner in which they draw on these actualizations to regulate their performance on line. (Seidlhofer & Widdowson, forthc.)

These “actualizations [ELF speakers] have been exposed to, and instructed in”, involving also and essentially elements from their 'plurilingual resource pool' (Hülmbauer 2009), constitute the basis for their creative language behaviour. The manifestations of this creative behaviour are then realized by means of general language rules, i.e. rules within e.g. English which make specific language forms theoretically possible even if such forms have not been produced yet. These rules and the related forms therefore constitute what Widdowson (1997) calls “the virtual language”:

that resource for making meaning immanent in the language which simply has not hitherto been encoded and so is not, so to speak, given official recognition. Widdowson (1997: 138)

Drawing on this virtual language, ELF speakers can be observed to adapt their speech to the conversational context they find themselves in because – and this represents the guiding principle of the following analyses and elaborations – creativity can only be successful in an interaction if it is “appropriate (i.e., adaptive concerning task constraints)” (Sternberg & Lubart 1999: 3).

3. Analysis

- Linguistic hybridity and creativity

As discussed in more detail in Working Paper 3, the traditional OLAAT (one language at a time) perspective towards multilingual practices needs to be reconsidered. The concepts of 'code-switching' and 'transfer' seem outdated as they imply a view on languages as separate entities and fixed borderlines between them which need to be crossed each time a switch or a transfer takes place. As ELF data examples have illustrated, plurilinguals seem to make more flexible, integrated use of their linguistic resources than the OLAAT perspective can account for. They do not only choose the appropriate language in a given situation, they also combine language elements from diverse sources into something more hybrid, into 'truly' plurilingual usage with forms that are adapted according to individual communicative needs (cf. also Böhringer & Hülmbauer forthc.).

This kind of hybridity and flexibility also plays a crucial role in the creative language use of ELF speakers. For example, idiomaticity in this case does often not relate to the fixed phrases that are encoded in native-speaker English, but to the joint on-line creation and negotiation of ad hoc idioms and metaphors:

Replication of the idiomatic behaviour of a particular English-speaking community cannot serve the co-operative function of the idiom principle in language use outside these communities. [...] ELF users will need to construct what they have to say more atomistically, in a bottom-up fashion, drawing on what is semantically encoded in the grammar and lexis of the language – in other words, by recourse to the open-choice principle. (Seidlhofer & Widdowson 2007: 365)

What Sinclair (1991) termed the 'open-choice principle', i.e. the ad hoc combination of elements rather than resorting to fixed units, is prevalent in ELF and can also be regarded as allowing for more creative scope in language usage. Together with the plurilingual resources available to the speakers, this can bring about exchanges like the following:

Example 1

(L1s: S1 = Spanish/Catalan, S3 = Greek)

S1: it's like come on let me on <6> (get moving) </6>

S3: <6> @@@</6>@@@=

S1: =because (in the) <smacks lips> (.) so many people walking it's like **rivers**? (.) <7> of peo</7>ple (1)

S3: <7> uhu </7>

S3: @@ (2)

[...]

S1: they (.) everybody <7> comes from the metro: from </7> my street and=

S3: <7> <un> x <un> (hundred people) (.) hm (.) aha </7>

S3: =@@<1>@@</1>@@

S1: <1> like </1>

S1: (two hundred) people <2> <un> xxx </un> </2> like **water** <3> it's </3> on the street

S3: <2> @@@@@ </2>

(data source: Barcelona team)

In this example, S1 – a native speaker of Spanish/Catalan – describes the large number of people on their way to the stadium each time FC Barcelona play in Camp Nou. She does so by resorting to water imagery, in this case the concept of 'rivers'. Her intonation signals insecurity about the choice of the image, but S3 – a native speaker of Greek – confirms understanding

immediately. The semantics of the utterance can be regarded as sufficiently transparent. A few lines further down S1, nevertheless, gives an alternative description of the situation, but again with a related concept. This time, she uses the more general, superordinate term *water*. The linguistic resources which seem to be at play here do not only relate to English metaphoricity (e.g. *streams of people*) but also to other plurilingual elements in the speaker's repertoire like Catalan *ruis de gent*. The practice of referring to crowds of moving people as fluid and water-related is widespread throughout the languages of Europe (comp. e.g. also German *Menschenströme*) and is based on at least double plurilingual support in our example.

In connection to this, Pitzl (2009) describes a similar instance of metaphorical language use in ELF in which plurilingual relations seem to play a crucial role. In the example given by her, the German native-speaker produces *we should not wake up any dogs* which on the one hand relates to the native English expression *let sleeping dogs lie* but at the same time, and probably more directly, to the German idiom *schlafende Hunde soll man nicht wecken*. As Pitzl argues,

the same metaphorical image is inherent to the codified English, German and French idiom as well as to S4's newly created expression. While this metaphor may be sleeping or dead for an L1 speaker when uttering the institutionalized form of the idiom, it seems to be reactivated in ELF. And it is this metaphoricity, I would argue, which allows for the formal variation and adaptation of the expression but at the same time makes it decodable and intelligible. (Pitzl 2009: 308-309)

The appropriation of language forms, also by means of plurilingual resources, represents a creative and at the same time effective way of using ELF. The fact that parallel or overlapping patterns (as the crowds-water-relation in our example) in various European languages are exploited also adds to mutual intelligibility between the interactants.

As regards the creative use of language as illustrated by the case of idioms, one can conclude that it is "not only a question of English" as "ELF is per definition a multilingual and multicultural situation and this fact is bound to affect the interaction and also the use of potential idioms" (Pitzl 2009: 315). Hybrid forms and flexible usage is a characteristic of ELF which has been shown to be effective in multilingual communication.

- Adaptive linguistic behaviour and creativity

Interactions of intrinsic plurilingual character – including conversations that take place via ELF – naturally require a lot of accommodative work from the speakers involved. They are faced with interlocutors that most likely have a different lingua-cultural background than themselves, often do not know much about their conversational partners' speech styles or preferred ways of interacting. In order to 'successfully' deal with all these challenges, adjustments have to be made so that common ground can be found and subsequently the communicative goal achieved (cf. e.g. Seidlhofer 2009). Whether the outcome of such an adjustment is creative and effective can in turn only be determined by reference to the context in which it occurs because, as Lubart (1999: 339) states, "creativity does not occur in a vacuum" (see also Carter 2004: 110).

Adjustments of a linguistically creative nature may manifest themselves on different levels. One of these levels has in more detail been elaborated on in RT 4.2's Working Paper 3, namely that of plurilingual influence in ELF in the form of what has traditionally been called 'code-switching', but also so-called transfer phenomena. By analysing the data we have obtained from some of our DYLAN partners we have found that one of the areas that seem to contain the most creative adjustments/creative language use is that of lexis. Such an observation made about ELF speech – and one that can certainly be transferred to any other form of plurilingual language use and thus lingua franca interactions – is hardly surprising since, as Schendl points out,

[s]peakers constantly have to adapt language to changing communicative needs in a changing environment. Thus new words are coined, old ones get their meanings extended, while on the other hand existing words or meanings constantly fall into disuse. (Schendl 2001: 25)

This in our case predominantly concerns the linguistic creativity in a more narrow/formal sense – for instance the morphology of single lexical items. This observation based on the comparatively small-scale DYLAN data 'corpus' – to use this term in a rather loose sense – is, however, corroborated by findings from the Vienna-Oxford International Corpus of English (VOICE). Since our RT has been working with the VOICE transcription conventions from the very beginning, our investigations of/search for innovative linguistic forms include words in tags labeled by VOICE as <pvc> – 'pronunciation variations and coinages' (cf. Pitzl, Breiteneder & Klimpfinger 2008: 23-27). The following

analysis of an extract of a focus group discussion about the linguistic situation of Helsinki university serves as an illustration of our findings:

Example 2

(L1s: S1 = Swedish, S2 = French (Canadian), S3 = Danish, S4 = English (Canadian))

S1: <2> i'm not sure </2> how stockholm university <pvc> **fin:anciated** </pvc> can you say that <pvc> **financiated?** </pvc>

S4: financed

S1: financed (.) e:r the whole service <3> i'm not </3>

S3: <3> alright </3>

S4: mhm=

S2: =<4> mhm mhm </4>

S1: =<soft> <4> but it was for </4> free </soft> =

(data source: Helsinki team)

The item that deserves special attention in this extract is produced by S1 in the first two lines of the recorded conversation: *financiated*.¹² If we based our analysis on ENL (English as a native language) norms, we would have to regard this word as non-existent. The 'correct' corresponding form would be *financed*. The speaker coining *financiated* has doubts about her coinage herself, evidenced by the fact that she immediately asks for her co-conversationalists' opinion. Her concern that she is using the English language 'incorrectly' may well be related to the presence of a native speaker (who also promptly provides the ENL form). Nonetheless, the fact that *financiated* is produced in the first place results from the creative exploitation of 'ordinary' suffixation processes (cf. Bauer 1988; on suffixation in ELF cf. Pitzl, Breiteneder & Klimpfner 2008). By adding *-i-* and the verbal suffix *-ate* as well as the past tense marker *-(e)d* to the base form, an actually non-existent English word *financiate* is created.¹³ However, what at first sight appears as a deviation from the English norm only, at second sight proves to be the creative and systematic coinage of an item that follows English word-formation rules and is in accordance with its phonological system. If we consider S1's linguistic background and the corresponding Swedish word *finansiera* we will see that the suffix *-ate* is not added randomly. On the contrary, a closer look at the vocabulary of several languages brings to light the fact that the English verb

¹² Interestingly, exactly the same coinage is produced and used similarly by an ELF speaker in the VOICE corpus (speech event: POWgd325; <http://voice.univie.ac.at>).

¹³ For a categorisation of suffixes into nominal, verbal, adjectival and adverbial suffixes cf. Plag (2003: 86-98).

finance consists of only two syllables seems to be the exception as in several other European languages (e.g. Danish: *finansiere*, French: *financer*, German: *finanzieren*, Italian: *finanziare*, etc.) the infinitive is made up of at least three syllables. Consequently, what can be seen here is that although English, or ELF, serves as a surface medium for intercultural communication in this interaction, the speakers' linguistic backgrounds always operate simultaneously. They are not automatically switched off only because a non-L1 is chosen as means of spoken communication. The creative act in phenomena of the above type then lies in the innovative application of existing rules so that they fit the current interactional context. The speaker coins a new word by applying the word formation rules that are in principle available in and through English, but the coinage is probably also stimulated by her first language.

Another interesting observation about this case of lexical creativity in ELF concerns the fact that the verbal suffix *-ate* does not seem to have been added to change the word class of the base form (cf. Pitzl, Breiteneder & Klimpfinger 2008: 31). Taking a closer look at it we can actually find that it rather emphasises it because in ENL the verb (*finance*) and the noun (*finance*) have the same form. If S1 had to use the third person present tense as in *i'm not sure how stockholm university finances* the verb and the noun (in its plural form, *finances*) could not be differentiated from each other. One could therefore hypothesize that in the example the verbal suffix was added initially because it helps to stress the word class and thus the propositional meaning the speaker may have intended, resulting in increased clarity and explicitness (cf. Pitzl, Breiteneder & Klimpfinger 2008: 32).

A further example of verbal suffixation is contained in the following extract showing Erasmus students discussing an article on career aspirations for their psychology class at the Universitat Autònoma de Barcelona.

Example 3

(L1s: S1 = Catalan/Spanish, S2 = Catalan/Spanish, S3 = Turkish, S4 = Dutch)

S2: erm (.) well they their study (.) in (solely) on teenagers (.) the relations er thei:r relationship between occupational aspirations (.) occupational <ono> az </ono> expectations=
SX-f: =mhm=
S2: =status aspirations status expectations (.)
SX-f: <2> @@@ </2>

S2: <2> and career </2> maturity and they try to (.) to <pvc>
relionate {relate} </pvc> all these variables

SX-4: mhm=

S2: =to know how they work for example if they're very mature people in
the er <smacks lips> in the center of the career maturity=

SX-3: =alright=

(data source: Barcelona team)

The lexical item in question is *relionate* produced by S2 in the middle of the extract. This example is interesting because it nicely shows how easily an English verb could be derived from a noun by simply applying the rule of adding a verbal suffix to its root. Although the actual outcome is not correct in ENL terms, S2 can be said to conform to this generally valid rule, i.e. a virtual rule, of English word formation. It furthermore has to be noted that a similar word exists in Spanish/Catalan (*relacionar*), which again points to the underlying influence of the speaker's L1 on the production of the English lexical unit *relionate*. Since S2's coinage works – the other speakers do not have any clarification requests – it can be considered appropriate for the context of this plurilingual conversation.

Concluding this section on creative and at the same time appropriate 'ways of doing' plurilingual communication – in the sense of 'situated practices' (cf. Mondada & Pekarek Doehler 2004; Vickers 2008) – it can be said that the appropriateness of an innovative construction can only be measured by taking into consideration the conversational context it appears in. If we assume a specific "'task as target' rather than '(standard) linguistic-form-as-target'" (Firth 2009: 155), it does not seem to matter whether the newly coined expressions conform to an ENL norm or not. Any underlying influence from other languages might even support both the encoding and the decoding process. What additionally has to be mentioned again (see introduction) is that the definition of creativity does not necessarily imply the creation of something totally new, something that has not existed in whatever manifestation before. Following Seidlhofer & Widdowson (forthc.)

the essential point to be made is that conformity to virtual rule does not preclude creativity but actually presupposes it as a necessary condition: the very identification of what is creative obviously depends on the reference to some norm or other that it does not conform to.

Thus, this phenomenon involves the “creative adaptation of *existing* resources” (Firth 2009: 155, emphasis added). So a plurilingual speaker might be viewed as more creative than a monolingual person because he/she potentially has more resources to draw upon, be creative with and manipulate for the purposes of an ongoing conversation.¹⁴ Whether this is done intentionally or not does not really seem to be of importance since “intentions are for the most part inaccessible, and irrelevant, anyway” (Seidlhofer 2006: 147). The multilingual recipient, on the other hand, then has more resources available to base his/her interpretation and understanding on.

4. Multilingual and monolingual situations

Multilingual Europe confronts us with the challenge of diversified, multifaceted communication and with the need for appropriate strategies to cope with it. Within the range of modes for intercultural talk, a clear distinction has traditionally been assumed between (a) multilingual and (b) monolingual approaches to communication. Under category (a) we would, for example, find the concept of receptive multilingualism/*lingua receptiva*, i.e. "a vehicle for effective communication between members of diverse language communities while using different languages simultaneously to reach mutual understanding" (Ten Thije forthc.). As two or more languages are explicitly used in parallel, the multilingual character of this mode is apparent. In contrast to this, *lingua franca* talk – with the speakers agreeing e.g. on English as their common means of communication – could seem to be (b) a monolingual mode at first glance. As soon as we take a closer look at the linguistic resources used and the forms created by ELF speakers, however, this assumption turns out not to hold. As the analysis has shown (cf. also Working Paper 3), ELF is essentially plurilingual in character. It thus has to be understood not only as a site of language contact (with speakers from different *lingua-cultural* backgrounds bringing their plurilingual resources to the communicative setting) but also as a kind of multilingual communication by itself (since these plurilingual resources are effectively applied through *lingua franca* forms).

In brief, ELF cannot be considered a monolingual mode. Its speakers are both plurilinguals and are pursuing communicative acts in intercultural settings. In this, they tend to assume a 'multilingual habitus' (Gogolin 1994) which accounts for flexibility in language use as well as heightened linguistic awareness and which distinguishes ELF speakers from English native-speaker communication with its underlying 'monolingual habitus' and code-fixation. The

¹⁴ Cf. 'The flexible mind' of plurilingual speakers as discussed in Marsh & Hill (2009: 6).

difference in habitus also relates to a difference in creative linguistic potential or, to put it provocatively, 'the advantage of incompetence':

Since non-native users of the language have not been normalised into conformity, they can be said to have a more direct access to this unused potential, unhindered by customary convention. So it is that non-natives can activate meanings in morphological features that natives have neutralised in compounds, bring words which are semantically distinct into association on the basis of their sound, extend the scope of existing rules and regularities, exploit redundancy, and so on. Of course natives can do all this too, and this, as we have seen, is what L1 poets do indeed do. But for them it is much more effort: they have to free themselves of the inhibiting influence of competence. (Seidlhofer & Widdowson 2006: 148)

ELF as medium of communication can be regarded as liberating since it encourages a relatively unconstrained exploitation of the resources of English and a readiness to draw on resources available through their plurilingual backgrounds. In contrast, monolingual native speakers of English and non-native speakers with 'near-native' proficiency in English are likely to be inhibited by their familiarity with, and deference to, the regulative conventions of ENL. In our view, thus, the difference between multilingual and monolingual situations is not so much a matter of language choice and number of languages spoken in an interaction but rather of the speakers' habitus, i.e. their approach to language (use).

5. Results and conclusions

Plurilingual ELF speakers are likely to use the language more flexibly than their native-speaker counterparts and display

enhanced awareness of the virtual, unencoded and unconventionalized meaning potential that is immanent in the language itself. (Seidlhofer & Widdowson 2006: 148)¹⁵

It also seems to be due to their ability of effectively combining plurilingual elements from what has traditionally been assumed to be separate language entities that the speakers' performance in divergent thinking is enhanced:

¹⁵ Cf. 'The metalinguistic mind' of plurilingual speakers as discussed in Marsh & Hill (2009: 8).

cross-language transfer is proposed as a cognitive mechanism underlying divergent thinking. A specific architecture of bilingual memory in which two lexicons are mutually linked to the conceptual system is argued to facilitate this process. Due to elaborative cross-language transfer, different concepts from unrelated categories can be activated simultaneously, which may account for bilinguals' greater performance on fluency, flexibility, and elaboration in divergent thinking. (Kharkhurin 2007: 203-204)

The scope of resources available to Europe's plurilingual interactants has significantly broadened and their ways of exploiting them have become much more complex. A combination of two kinds of virtual resources in the language can be used for creativity in ELF: (1) the virtual possibilities within English, i.e. novel forms that can be realized e.g. through traditional word-formation processes, and (2) the virtual possibilities available through multilingual contexts, i.e. hybrid forms as manifestations of a conglomerate of plurilingual elements that have previously been unrelated. As Seidlhofer and Widdowson (forthc.) put it: "It is this 'deviant' regulative use of the virtual possibilities in the language, we would argue, that accounts for creativity."

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1. Introduction

RT 4.3 is concerned with providing a historical background on multilingualism for the DYLAN-project. For the specific purpose of WoPa 4 all research teams have the task to explore possible links between multilingualism on the one hand and creativity and innovation on the other. Accordingly, we will describe in broad outline how a possible relationship between multilingualism and creativity could be approached from a historical perspective. Our focus will be on a possible link between creativity and diversity and, as one central aspect of diversity, linguistic diversity.

2. Creativity

Research on creativity generally focuses on one of the following aspects of the topic – also called the 'three Ps' of creativity: person, process, product. In the 1960s, there was a growing interest in creativity from a sociological perspective which resulted in the inclusion of a 'fourth P', called 'press' (i.e. environment) (cf. Cropley 2006:126).

Studies evolving around the 'first P' - person – center on the creator and his/her skills. Amabile (1982) e.g. lists three variables as relevant for a person's creativity: domain-relevant skills (including domain-specific knowledge and technical skills), creativity-relevant skills (e.g. the willingness to take risks) and task motivation (Amabile rates for example enjoyment and passion as motives which are more common in creative persons than money or grades).

Different types of creative persons are described within the *little-c* / *Big-C* dichotomy: *Little creativity* is also referred to as *everyday creativity* and covers creative acts like the decorating of the own apartment or the preparing of a special dinner for friends. Studies on *Big Creativity* or *eminent creativity* on the other hand focus on the achievements of well-known creators (e.g. famous poets like W.H. Auden or famous physicists like Heisenberg). Kaufman & Beghetto (2009) add the *Pro-C* (*Professional Creativity*) category to this *little-*

c / *Big-C* dichotomy in order to address the creativity of experts (musicians, writers or scientists) who are very successful in their domains but who do not (yet) qualify for 'creative greatness'.

Studies which focus on individuals exhibiting *Pro-C* or *Big-C* commonly also address the 'second P' of creativity (i.e. 'process') by researching the intrapersonal development of creativity, i.e. the emergence of creative skills in the course of an individual's life. Simonton (1977) who studied the lives of great classical composers, suggests a typical scheme of development for *Big-C* which starts in an individual's 20s, reaches its optimum in his/her 40s and then regresses towards zero.

Moreover, there are also studies which take the creative product (the 'third P') as a starting point. A product can first of all be a tangible product, as for example a microscope, a printing press or a scalpel. Secondly, it can be intangible but still very specific, like a method for mass production of paper or the discovery and description of the human circulatory system. Thirdly, a product can consist of new ways of conceptualising the world, as for example through heliocentrism or through the post-modern sociological concept of 'shifting' identities (cf. Cropley 2006:125).

To what extent a certain 'product' is rated as creative is determined by internal as well as external criteria. As internal criteria are commonly named 'novelty' and 'usefulness'. Besemer & O'Quin (1999) e.g. give as criteria 'novelty' (a product that is new and original), 'resolution' (a product which is useful, valuable and understandable) and also 'elaboration and synthesis' (a product which is complex, elegant and well-crafted).

The decisive external criterion for products to be called 'creative' is, according to Cropley (2006:126), that 'they cause surprise in beholders'. Surprise occurs when a product deviates from what had been known up to that point. This applied for example in the history of Europe to an object which allowed mass circulation of a certain text (i.e. the printing press) or to an object which depicted the world (more or less) true to scale (a globe, or a world map). The 'surprise factor' applies not only to the reception of new objects but just as well to new ideas or conceptions: the heliocentric view of the universe which placed the sun at the center instead of the earth constituted a radical change to what was commonly known at the time.

However, Cropley (2006:126) stresses that not everything that is surprisingly different is also judged as 'creative' by society (at this point, the 'fourth P', viz. 'press' or 'environment' comes in). Deviation from the usual is not enough, social acceptance of deviation is necessary as well. Accordingly, Cropley (2006:127) makes a distinction between *orthodox creativity* on the one hand and *radical creativity* on the other. The former can be characterized as causing changes that stay within the system, the latter as bringing about changes which challenge the system. Orthodox creativity is seen as more effective (because it is socially accepted). Engaging in radical creativity is in turn seen as less effective because the creator has to overcome the hostility of (parts of) the society who sees the creative product as a threat. However, what is socially accepted can change over time: the heliocentric view of the universe is a prime example for a product of radical creativity at the time of its creation. Today of course, it has full social acceptance and Copernicus is rated as an example of *Big-C*.

Another attempt of evaluating creativity is the Propulsion Theory of Creative Contributions (Sternberg, Kaufman & Pretz 2002). It rates creativity as to how it changes a specific field (e.g. a scientific discipline, an artistic field or a literary genre). It distinguishes eight types of contribution which a creative product can make to a certain field: the first four stay within the framework of an existing paradigm (similar to Cropley's orthodox creativity), the final four are attempts to replace the current paradigm (similar to Cropley's radical creativity). Among the final four is for example what is called 'reinitiation' where a contribution takes a field to a new starting point and progresses from there: for example, again, Copernicus' heliocentric view of the universe; or William Harvey's description of the human blood stream as a circulatory system in 1628 which broke radically with earlier views on the origin of blood. Among the first four is for example 'forward incrementation' where a contribution only helps advancing earlier findings a little bit further: this would e.g. apply to the identification of the capillary system connecting arteries and veins (in 1661 by Marcellus Malpighi) which confirmed Harvey's view of the blood system.

Last but not least, we would like to point to an aspect of research on creativity where the focus is on social influences on creativity. These studies postulate the importance of social support networks for creative productivity. One example are studies which are concerned with the role of models and mentors – school teachers, parents, famous artists etc. – in the development of creativity in individuals. An important function of those mentors is to raise

awareness about creativity as a legitimate goal in life or to offer creative individuals a safe space to develop creativity.

A second example are studies focusing on the beneficial effect of groups on creativity. Larey & Paulus (1999) for example name the following advantages of groups: they provide information (more than one individual possesses), they motivate creative activity, they provide models and they give feedback. Page (2007) focuses specifically on heterogeneous groups: he argues that groups with members from diverse scientific, social and cultural backgrounds produce better results (a more creative output) than homogeneous groups, among other things because of their differing (amount/type of) knowledge and perspectives (the group's 'cognitive diversity').

As a third example, there are studies which explore the broader social, political and cultural context of creativity and address the conditions under which individuals create 'new and useful products'. Cropley (2006:128) addresses this aspect of creativity research under the header 'The social climate'. He uses it as a metaphor for the 'combination of behaviors, attitudes, values, and feelings' which can be favorable or unfavorable for (the development of) creativity.

In the next two sections we will elaborate on social influences on creativity from a historical perspective, hereby focusing on creativity in the field of science. We will also try to find a way to establish linguistic diversity as one of the social factors which have a bearing on creativity.

3. Creative scientists in the 16th century

Early Modern times have repeatedly been characterized as a period of scientific revolution in Europe (cf. Van Os & Potjer 2003:107). The emergence of the new heliocentric view of the universe gave rise to a great scientific interest in astronomy. In addition, in the 16th century, there was considerable progress being made in the fields of anatomy and geography (especially cartography). The 17th century saw new developments in mathematics and physics and in the 18th century, new discoveries were made in the fields of biology and chemistry.

As actors in this scientific revolution we can identify creative individuals: Copernicus for astronomy, Harvey for anatomy, Mercator for geography, Stevin for mathematics, Newton for physics etc. Writings of their contemporaries allow us to judge their level of 'greatness' at the time. Moreover, we can assess

their *Big-C* status from a present-day perspective: we can check the length of Encyclopedia Britannica entries for their names or we can count the number of hits their names generate in Google. Additionally, we can evaluate the contribution that their 'products' (new objects, ideas etc.) made to the advancement of their field of research, or – more accurately – their *fields* of research as most scientists in Early Modern Europe excelled in more than one discipline. We can contrast their contributions with the state of knowledge at the time. We can also assess their achievements in terms of social acceptance and rate their products as radical or orthodox creativity. And last but not least we can research their individual development into a creative being by reconstructing their early education (which included for most of them the acquisition of foreign languages, mostly Latin and Greek but also French or German), listing their first experiments, important scientific writings etc.

Even more interesting, however, in the light of our research task, is the question as to why it was in Europe and in this period in history that scientific creativity gained such momentum. If we want to study linguistic diversity as a factor which is relevant to the emergence of creative products (new objects, ideas) we will first have to establish other factors which are possibly relevant to a rise of creativity. As a next step we can define the relationship between linguistic diversity and creativity within a broader set of factors which are relevant as conditions for creativity.

In the next section we will specifically focus on one aspect of 16th century scientific progress: advancement in the field of cartography. Moreover, we will address a set of factors which are assumed to be relevant to the development of creativity in this field.

4. Mapping the world

In 1595, Rumold Mercator, the son of Gerhardus Mercator, published a collection of 107 maps under the title 'Atlas sive Cosmographicae Meditationes de Fabrica Mundi et Fabricati Figura'. By choosing this title, he provided a name for an object which over the centuries became a widely used tool in trade, tourism and education: a collection of thematically and geographically arranged maps in book-form – the atlas. 25 years earlier, in 1570, Abraham Ortelius had already published a comparable collection of 53 maps in a book with the title 'Theatrum Orbis Terrarum'.

Both Mercator and Ortelius were born and raised in Flanders, at a time when the region was part of the Habsburg ruled Seventeen Provinces. Mercator studied at the university of Leuven and moved to Duisburg in 1552 where he taught mathematics at the newly founded university. Ortelius' family was originally from Augsburg, he studied in Antwerp and travelled extensively throughout his life: within the Seventeen Provinces, to England, Ireland, France, Germany and Italy. Except for his atlas, Mercator is also known as the inventor of the 'Mercator projection', a method of representing the surface of a sphere (the earth globe) on a plane (a map) which is in use until the present day. Moreover, Mercator produced several of the first terrestrial and celestial globes. Ortelius is not only known as a cartographer but also as the first one to put forward the hypothesis that continents drift (in his book 'Thesaurus Geographicus').

Other examples for actors who helped advancing the field of cartography are Petrus Kaerius and different members of the Blaeu family. Kaerius had to flee from his birthplace Antwerp in 1584, at the age of 13, and take refuge in London where he learned the art of map engraving. He eventually returned to the Netherlands, settled in Amsterdam and became a productive cartographer who collaborated with colleagues from the British Isles and the Low Countries, for example with Willem Blaeu. Willem Janszoon Blaeu was born in Alkmaar, in the Netherlands, in 1571 and was taught in astronomy and cartography by the Danish scientist Tycho Brahe. He established himself as a manufacturer of terrestrial globes, of maps and sea charts and was appointed official map maker of the Dutch East India Company in 1633. His business was carried on by his sons and dominated the European map making business until the end of the 17th century.

It is important to stress that maps were products of creativity in different fields. Map making in the 16th and 17th centuries involved, among other things, the technique of engraving maps, of artfully coloring and decorating maps (frequently with exotic plants and animals) and the skills of marketing and selling maps. Additionally, the manufacturing of maps and globes was closely related to research in the fields of mathematics (cf. map projection), astronomy (cf. celestial globes, sea charts) and geology/geophysics (cf. the history of the continents). Moreover, atlases in Early Modern times were supplemented with a wealth of historical and anthropological information on the regions they covered (e.g., the text accompanying a 1595 edition of a Mercator Atlas amounts to 416 pages¹⁶). For this purpose, historians

16 http://www.orteliusmaps.com/ort_background.html

sometimes collaborated in the making of maps or atlases: the Dutch historian Caspar van Baerle for example contributed information on history, inhabitants, flora and fauna of North Eastern Brazil to the 'Rerum per octennium Brasilia', an atlas with maps of Brazil which was published in Amsterdam in 1647. Some cartographers, however, wrote their own accompanying texts, as was for example the case for Ortelius.

Of course, the art of map making did not come out of the blue: European cartographers in the 16th century could fall back on earlier cartographic traditions from antiquity (cf. Ptolemy's maps). However, the amount of progress made in the 16th and 17th centuries is impressive and leads us back to the question why it was in Europe and in this period in history that scientific creativity gained such momentum.

Some explanations for the 'scientific leap' Europe did at the time, for the 'joie de trouver', refer to the power of the market, the fact that enterprise was free and inventions paid off, in terms of money and prestige. This 'climate' was aided by the fact that the church and with it old legends warning against too much ambition (cf. expulsion from the Garden of Eden, Tower of Babel) lost influence in Early Modern Europe (cf. Landes 1999:59). Other explanations focus on increasing geographical mobility, the desire to expand trading activities beyond the own region and even beyond the continent. This desire created the need for maps which would guide merchants towards new trading grounds. This certainly provided a favorable context for scientific progress in the field of cartography. Reports from trading expeditions in turn provided facts and stories from 'exotic' parts of the world which fueled the imagination and creative expression of map illustrators (cf. the exotic plants and animals on 16th century maps). Moreover, some reports formed the basis for the texts which accompanied the maps.

A third line of explanation concentrates on the emergence of a European scientific community in Early Modern times. The number of scientists and the number of scientific experiments increased and the invention of the printing press as well as improved transportation across Europe facilitated contact between scientists. To this added the foundation of Academies of Science in England, France and Italy where scientific exchange was especially encouraged. Van Os & Potjer (2003:113) additionally point out that the existence of a common lingua franca – Latin – also provided a favorable context for the establishment of what they call a 'European Republic of the Learned'. This factor of 'scientific networks' certainly also applies to the field of

cartography: the short biographies given above for some *Big-C* cartographers already point to close cooperation within and across the discipline; Clark & Black (2006:111) specifically stress that cartographic products are results of teamwork par excellence.

So far, we presented the scientific revolution of Early Modern Times as a common European phenomenon. Accordingly, we described the stunning progress made in the field of cartography as generally European. However, we should not overlook possible differences within Europe with regard to the development of (different fields of) science. With regard to cartography, we can safely assume that the majority of *Big-C* map makers have their origin in the Low Countries. Of course, we know of cartographers from various regions of Europe throughout the 16th century. However, they mostly only produced maps of their own region (as for example the English cartographer John Speed did for various parts of England).

Cartographers from the Low Countries are, in contrast, known for producing and combining maps of different parts of Europe and the world (Kaerius for example is known for engraving a map of the region of Romania, cf. Clark & Black, 2006:113). Moreover, there are various examples of cartographers from the Low Countries who conducted fundamental research (in mathematics etc.) aiding the further development of maps and globes.

Therefore, at this point, our more specific question relates to differences in development within Europe: Why were the Dutch and Flemish cartographers ahead of others in Europe at the time? Our hypothesis would be that their 'advantage' is related to a better, or different, integration into a 'network of scientists'. Within such networks, linguistic diversity could play a role. We will elaborate on this question in the next section.

5. (Diverse) Networks of creative scientists

In creativity research, there are studies which suggest that groups have a beneficial effect on creativity. Moreover, there is research pointing to the advantages of heterogeneous groups because of the 'cognitive diversity' they exhibit (cf. section 1). The groups referred to in these studies generally consist of members who work on the same project and engage in face-to-face interaction or at least exchange ideas on a regular basis.

From a historical perspective, in a study on (groups of) creative scientists in the 16th century, such an approach is of course not feasible. We can, however,

focus on the interaction of a scientist (in our case: a cartographer, for example Ortelius) with his peers (other scientists, but also merchants, artists etc.) at a certain point in his career. This would include investigating their correspondence ('epistolary networks'), scientific writings, reactions to scientific writings, accounts of journeys etc.

One possibility would be to conceptualize this contact between scientists in terms of social networks. Social networks are an anthropological concept depicting a multiple web of relationships which individuals have with other people.¹⁷ Members of a social network can be bound to each other by different kinds of social relationship: e.g. family, friendship and work (cf. Boissevain, 1987). Each individual is involved in various networks which partially overlap. The density of a social network depends on the degree to which the people who form the social network all know each other; applied to the social network of Ortelius a high density would imply that not only Ortelius interacted in some way with Mercator, the king of Spain, a cartographer from Italy or a printer from Antwerp but that the mentioned people also interacted with each other. Moreover, social networks are rated as to their multiplexity: in highly multiplex networks, people are engaged in multifaceted relationships with each other. In the case of Ortelius this would mean that he was for example not only a colleague of Mercator but also his friend, or related through kinship/family links. Network density and network multiplexity together determine the strength of a network.

For our purpose, however, it would not suffice to investigate the strength of social networks Ortelius was engaged in with fellow scientists/cartographers. It would be imperative in the first place to assess the cultural and linguistic backgrounds of the people he interacted with in his social network. After all, we are aiming at establishing a link between cultural and – above all – linguistic diversity and the apparent 'Big Creativity' in the field of cartography in the Low Countries in the 16th century. There are, according to us, two aspects of linguistic diversity which are relevant in this context.

On the one hand, there is the more cognitive approach where different languages represent different ways of encoding knowledge and experience (cf. the notion of linguistic relativity). People with different mother tongue(s) or skills in different languages would then contribute (slightly) different ways of

¹⁷ Speaking of social networks: this concept has found an interesting parallel in the digital world of the 21st century, viz. in the digital social networks connecting people on an international scale (as for example Facebook). These networks could also constitute an interesting object of investigation (within research on linguistic diversity and/or creativity).

conceptualising the world (cf. Kramsch 1998:11). This, in turn, could add up to new (and possibly creative) approaches within a scientific field. On the other hand, there is the cross-cultural or intercultural perspective: from this perspective, contact with people (other scientists, artists etc.) who speak different languages and come from different cultural backgrounds can lead to misunderstandings and even conflict, but equally to new insights and knowledge. In this manner, language and culture contact can provide a motivation for scientists (in our case: cartographers) to try new (and possibly creative) approaches.

Methodologically, one possible approach to highlight the role of the factor diversity could be to map out two social networks for Ortelius: one where we capture his interaction with scientists, artists and merchants from the Low Countries who have the same cultural and linguistic background (with whom he interacts in his mother tongue); and one where we capture his interaction with scientists, artists and merchants from other regions in Europe or the world who do not share his cultural and linguistic background (with whom he does not interact in his mother tongue(s) but e.g. in Latin).

We could then compare these two types of social network as to their respective strength. Moreover, we could compare the relative strength of either of his social networks (linguistically homogeneous vs. linguistically heterogeneous/diverse) at different points in his scientific career. It would be interesting to determine if the linguistically homogeneous or the linguistically heterogeneous/diverse network was 'stronger' at the high point of Ortelius' creative development (and what the actual role of language skills and/or language use was in this development).

The same approach could then be applied to the social networks of other map makers in the Low Countries in the 16th century (and, eventually, of other groups of scientists). The aim would be to assess the role of 'diverse/heterogeneous networks' in the creative development of 16th century cartographers from the Low Countries (and, eventually, of other groups of scientists).

6. Conclusive remarks

The task for this fourth Working Paper was to outline a possible study which deals with multilingualism and creativity from a historical perspective. In this paper, we suggest to choose as an object of investigation scientists from the

16th (and/or 17th) century who produced something new, useful, attractive and surprising (i.e. something 'creative') and contributed, with their products, to progress in their field of expertise. It is commonly assumed that creativity in science was extremely high in Early Modern times in Europe. It is equally common to assume that, in the field of map making, creativity was especially high in the Low Countries. There are various types of explanation for this apparent advantage in the field at this time in history. We suggest in this paper to single out the factor 'cultural/linguistic diversity' and to assess its role in the creative development of 16th century cartographers from the Low Countries. Our hypothesis would be that linguistic diversity could be one factor explaining their creativity. With linguistic diversity we refer (1) to the degree to which they engaged in encounters with other cultures and languages within a network of scientists and (2) the degree to which they – because of different language backgrounds - contributed different 'world views' to a network of scientists.

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