

1 Introduction: Applying Complex Dynamic Systems Principles to Empirical Research on L2 Motivation

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When nonlinear system dynamics was introduced into second language acquisition (SLA) research – under various rubrics such as chaos theory (Larsen-Freeman, 1997), emergentism (Ellis & Larsen-Freeman, 2006), dynamic systems theory (de Bot *et al.*, 2007) and complexity theory (Larsen-Freeman & Cameron, 2008) – the new approach, which may be seen as the ‘dynamic turn’ in SLA, resonated with many scholars because nonlinear system dynamics appeared to nicely describe several puzzling language learning phenomena. To offer but one illustration, the so-called ‘butterfly effect’ explained why language teaching input sometimes had considerable impact on the learners’ progress, whereas at other times it led only to minimal, if any, uptake. The dynamic principles introduced also made intuitive sense research-wise. We have long known that the manifold issues and factors affecting SLA are interrelated, and the new paradigm represented a holistic approach that took into account the combined and interactive operation of a number of different elements/conditions relevant to specific situations, rather than following the more traditional practice of examining the relationship between well-defined variables in relative isolation.

Thus, proposals for a dynamic paradigm shift in the research community during the first decade of the new millennium were generally well received. However, by the end of the 2010s it had become noticeable that while there was a growing body of literature on complex dynamic systems within SLA contexts, very little of this work was empirical in nature. In other words, scholars spent much more time *talking* about research in a dynamic systems vein than actually *doing* it. Furthermore, even when dynamic principles were

referred to in data-based studies, this was often to explain away difficult-to-interpret results, stating in effect that such results occurred because of the unpredictable or ‘emergentist’ nature of the system. At the same time, in informal conversations at conferences, it was not at all uncommon to hear scholars privately express the sense of being at a loss as to how exactly to go about researching dynamic systems.

The Challenge of the New Paradigm

This growing uncertainty was to some extent understandable since – as Dörnyei (2009) summarised – at least three aspects of such an approach inevitably pushed researchers into uncharted territories (for a detailed overview, see Verspoor *et al.*, 2011).

- Modelling *nonlinear change* (especially quantitatively); this has been succinctly summed up by de Bot and Larsen-Freeman (2011: 18) as follows: ‘If the process is nonlinear, how is it possible to make any predictions that are likely to hold up?’
- Observing the operation of the *whole system* and the interaction of the parts, rather than focusing on specific units (e.g. variables) within it. In de Bot and Larsen-Freeman’s (2011: 18) words: ‘if everything is interconnected, how is it possible to study anything apart from everything else?’
- Finding *alternatives* to conventional quantitative research methodologies that, by and large, relied on statistical procedures to examine linear rather than dynamic relationships.

The combination of these three issues seriously questioned the feasibility of investigating cause–effect relations, the traditional basis of generalisable theories in the spirit of the ‘scientific method’ (see Dörnyei, 2007). As Byrne and Callaghan (2014: 173) put it:

we cannot decompose the system into its elements and use control over discrete elements whilst varying just one of them, either directly or through the use of treatment and control groups, in order to establish causality in terms of the properties of those elements.

We should note here that the challenge that applied linguists and language psychologists have been facing is not merely having to master new research skills in order to find their bearings in a novel paradigm, but is related also to a much broader issue: the difficulty of transferring the nonlinear systems approach from the natural sciences – where dynamic systems theory has been flourishing in several areas (such as thermodynamics) – to

the social sciences. In the natural sciences, where the main units of analysis are molecules or objects, it is possible to reconstruct the movement of a complex system by applying intricate mathematical modelling. However, in the social sciences, where the basic units of analysis are self-reflective human beings, dynamic situations tend to be so complex – and embedded in each other in such a multi-layered manner – that accurate mathematical modelling might be an unrealistic expectation. De Bot (2011) explains that the alternative to such hard-science-like attempts to adopt mathematics-based tools and models is a ‘soft’ approach, which simply imports dynamic *metaphors* from the natural sciences that are seen as useful in explaining observed phenomena in a qualitative and interpretive manner. While this second approach might appear more realistic, it still poses considerable paradigmatic challenges. Many of the core metaphors of complex dynamic systems theory – for example the central notion of ‘attractor states’ – originate in pure mathematics (Byrne & Callaghan, 2014), and it is questionable whether we can meaningfully deploy such metaphors by mapping them onto a social reality. For example, as Byrne and Callaghan (2014: 73) argue, attractor states can be described well by equations in abstracted topological spaces, while for social scientists they are ‘real regions in real state spaces’. The social and the mathematical realms are not isomorphic, and therefore these scholars provocatively conclude:

Frankly with some exceptions, almost all of which are spatially oriented, mathematical and computational social science remains at the level of the banal and trivial. This is not because the methods are at a very early state of development. It is because . . . [they are] not a proper basis for the construction of accounts of complex realities which are made and remade in considerable part as a consequence of human social agency. Mathematics *can* be a useful tool for describing the reality but reality is its messy self, not a higher abstract order existing in mathematical form. (Byrne & Callaghan, 2014: 257)

Thus, when we started to think about the current anthology, the prevailing situation in the field of SLA was twofold. On the one hand, dynamic systems research was hailed as having a promising potential for a number of reasons:

- it was hoped to be able to capture the multi-faceted complexity of the SLA process;
- it treated learner-internal and learner-external factors in an integrated manner, thereby creating a socially grounded approach in which the context was seen as part of the system;
- it foregrounded individual-based research, thereby offering increased ecological validity and better insights into seemingly ‘chaotic’ occurrences;

- it offered a way of removing any qualitative/quantitative boundaries and merging the two approaches within some form of mixed methodology;
- it highlighted the significance of change and development in general – and thus longitudinal research in particular – which was more than welcome in a field that was, by definition, centred around ‘acquisition’.

On the other hand, scholars interested in the approach found themselves not only without any templates or traditions they could rely on in producing workable and productive research designs, but also without a coherent set of new research metaphors to use. Consequently, although the approach was ‘in the air’, it became highly elusive when it came to operationalising it in concrete terms. The absence of established research tools and paradigms affected PhD students in particular, because for many of them, doing dynamic systems research seemed just too difficult and too risky.

Dynamic Systems Research and Motivation

Second language (L2) motivation research was initiated by social psychologists Robert Gardner and Wallace Lambert in Canada (Gardner & Lambert, 1959) by adopting a macro perspective that captured the overall language disposition of substantial learner samples on a large timescale. At this level of analysis, traditional statistical procedures that utilised linear relationships (such as correlation-based analyses) worked well. This situation, however, changed dramatically in the 1990s, when researchers’ interests shifted to a more micro-level analysis of motivation, focusing on how motivation affected language learning behaviours and achievement in specific learning contexts such as L2 classrooms. When motivation was conceptualised in such a situated manner, one could not help noticing the considerable fluctuation in learners’ motivational dispositions exhibited on an almost day-to-day basis, which led to attempts to reframe the concept in process-oriented terms (e.g. Dörnyei, 2000; Dörnyei & Ottó, 1998). However, process models that were based on cause-effect relationships failed to offer a realistic account of the motivational phenomena observed in real-life situations; the linear progression implied by a flow-chart diagram was not reflected in the seemingly random iterative processes that many learners described. Therefore, as Dörnyei (2009) stated, it was only a matter of time before scholars started to look for a more dynamic conceptualisation.

In 2011, Dörnyei and Ushioda prepared a book-length overview of L2 motivation research, which contained extensive arguments to support the theoretical validity of dynamic approaches. They extended this discussion to also include possible selves and Dörnyei’s (2005, 2009) L2 Motivational Self System, which they saw as a dynamic ‘motivation–cognition–emotion amalgam’. However, when it came to providing sample studies in Part III of their

book, they could only identify a single paper in the literature that explicitly embodied dynamic principles: MacIntyre and Legatto's (2011) study, which employed an 'idiodynamic' methodology to capture the fluctuation of rapidly changing affect in relation to the participants' willingness to communicate. The paucity of dynamic systems research closely reflected the general trend in SLA research mentioned above, namely that while most of the cutting-edge theorising took it for granted that the future lay along the dynamic path, most of the actual empirical research followed traditional, non-dynamic research approaches.

The recognition of the absence of relevant empirical studies played a significant part in our decision to initiate a large-scale project exploring the researchability of dynamic systems. We believed that the topic of L2 motivation was an ideal content area for such an endeavour, partly because motivation, with its ups and downs and ebbs and flows, was an SLA phenomenon that seemed to lend itself to the application of dynamically informed research designs, and partly because the currently most established constructs in the field – the various L2 self-guides – are by nature inherently dynamic and would therefore be well suited targets for investigation using dynamic approaches. The challenge we set ourselves was thus fairly straightforward: we could either initiate a robust research project that takes well-established motivation constructs and, by applying dynamic principles to their investigation, produces convincing empirical evidence for the sustainability of the approach; or we would have to come to terms with the fact that the dynamic approach in SLA might be simply an attractive but ultimately unrealisable idea. The production of this volume was therefore intended to serve as the primary testing ground.

The Current Anthology

As a first step in our efforts, invitations to join the project were sent out to a large number of established researchers specialising in language learning motivation. The initial reception was very positive and over 40 scholars from three continents agreed to participate. At the same time, we succeeded in securing a contract for an anthology on the topic with *Multilingual Matters*, which allowed the planning to start taking concrete shape. Interested scholars first met at the 2013 convention of the American Association of Applied Linguistics in Dallas, Texas, where a well-attended colloquium was co-organised by Dörnyei and MacIntyre to showcase the goals that the project had set out to achieve. The conference also included several other papers on dynamic systems issues, many of them not in motivational areas, thus prompting the idea of adding a conceptual part to the volume in which some of the central themes and notions are discussed in a generic manner by experts in the field.

The eight months following the conference involved intensive activity as an increasing tide of initial manuscripts were submitted, edited and revised, resulting finally in 21 accepted papers. During this process we applied unusually strict selection criteria in the sense that we turned down several chapters that were of publishable quality (and will hopefully be in print soon in some other forum) because, in our judgement, they were not instantiating complex dynamic systems research, an issue to which we shall return in the Conclusion. (Also, we should mention, an unintended result of this process is that we are beginning to realise how many free drinks and meals it will take over the next few years to reconcile our friends whose work was deemed insufficiently dynamic. . .) As we have come to the end of a three-year journey, we can commend to the reader the collective fruit of a great deal of dedication and hard work on the part of all the contributors. This has not been an easy project to pursue for any of us, but it has definitely been a project of commitment and passion – which of course should always be the case with any book on motivation!

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