Exchanges

The Interdisciplinary Research Journal

Volume 7, Issue 1 (Autumn 2019)

Issue Highlights:

- Problematic biography and literature linkages
- Reading comprehension and Chinese language acquisition
- Simulating hybrid electric vehicle engineering solutions
- Considering personal impact & public engagement
- Bryan Cheyette discusses Jewish and Post-Colonial Studies

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Effective Contributor Communication and Editorial Process Efficacy: Editorial, Volume 7, Part 1

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> *By publishing we mean simply the communication and broad dissemination of knowledge, a function that has become both more complex and more important with the introduction and rapid evolution of digital and networking technologies. There is a seeming limitless range of opportunities for a faculty member to distribute [their] work, from setting up a web page or blog, to posting an article to a working paper website or institutional repository, to including it in a peer reviewed journal or book. (**Brown et al, 2007**)*

Introduction

Welcome to the portentous Thirteenth edition of *Exchanges: The Interdisciplinary Research Journal*, as we move towards our seventh year of continuous publication. This issue we are delighted once more to bring you a selection of new thinking and insights, drawn from emerging scholars from across the disciplinary spectrum.

Over recent months, I've had the pleasure of talking about *Exchanges* and the work we do, in relation to scholarly communication and researcher development, at various locations in the UK and abroad (**Johnson, 2019a & b**). Speaking with audiences of researchers, students and educators, I've been acutely reminded of how communication in many forms lies at the heart of the academic experience. We are as scholars engaged within an environment where formal and informal modes and modalities of communication, along with our abilities to dynamically adapt to changing priorities, continue to be crucial career skills (**Hope, 2013; Nicholas, 2018**). Notably, readers will discover that one of our articles this issue helpfully resonates with aspects of academic public communication. Interestingly many other realms of work, such as law, librarianship, public relations and politics may lay claims to being 'the' communicating profession; although, I'd support the axiom that our realm's veracity is greater than that suffusing much of the Global North's public sphere discourse.

Given my professional life and interests have long centred around regular performative acts of communication, I suppose it's unsurprising that these recent conversations have highlighted to me the variety, complexity and nuance of the communication channels deployed and employed by my editorial team to deliver on the promise of an interdisciplinary journal 'by and for early career researchers' (**Johnson, 2019b**). During their induction, and as part of our ongoing team discourse, all of our editors are reminded of the crucial central communication role each plays. Updating authors on editorial progress, negotiating with reviewers, while simultaneously encouraging prospective contributors are all part of the effective communicative mix (**Morris et al., 2013**).

The editorial counterpoint to this is 'when communication goes bad'. Over the past couple of years I've discovered to my mild horror that one of the single most challenging and frustrating elements of editing a journal like *Exchanges*, are when individuals seemingly drop off the planet and cease responding to emails. Admittedly, sometimes this can be the result of technical error. This can be a consequence of many peoples' and institutions' spam filters being a little 'extra' vigilant: meaning our messages requesting authorial revisions or requests for review updates can sometimes be slotted away in the same folder with those concerning special pills and unbelievable financial opportunities. My message to any contributors to *Exchanges*, or any other journal, is check your spam folder frequently, as you never know when some innocent, well-meaning communication may have become ensnared by the digital dragnet.

However, much as I might wish it though, the majority of the editorial communication problems are human mediated. Some are inadvertent and a particular artefact of running a journal 'for and by early career researchers'. Newly minted academics and post-graduate researchers alike are a highly motile species, and with peer review processes often progressing over a period of months there's a notable risk of their relocation to new employers, without updating their contact details. This can result in my team fruitlessly messaging moribund addresses, producing a morass of unfinished close to publication manuscripts, which without author input cannot be progressed any further. Over the past year there have been a few occasions where we've had to take the regrettable decision to decline perfectly good manuscripts because the author has ceased engaging with us for over six months. My further advice therefore to all contributors is make sure you keep your email address updated on your *Exchanges* profile. It only takes a moment and can make all the difference in progressing our publication efforts in a timely manner.

Conversely to technical errors or individual omissions, there are those journal contributors who *do* stop responding to emails, knowingly. If you're engaged with the scholarly publishing discourse you'll be aware there are many, not especially new, gripes about peer review being the biggest hobble to effective and speedy research communication (e.g. **Gowers, 2017; Hunter, 2012; Leslie, 2005**). Not all of these concerns centre on delays, and it must be acknowledged that a quality review of a manuscript is not a five minute task, especially alongside a myriad of competing priorities. Certainly, we remain deeply grateful to every review who does contribute their time to conduct one.

Nevertheless, authors and reviewers can choose to cease responding to our communications. Regrettably, some potential reviewers do not even reply to my editors' initial enquires about taking on a review. Even a brief 'no thanks' would be preferable to radio silence. Thankfully though it is only a minority of reviewers who are unable to deliver on time. Yet, all of this adds to delays in a manuscript's journey towards becoming an article. Which partly explains why over the coming months we'll be turning on a new feature for *Exchanges* called auto-reviewer-reminders. This will gently but effectively automatically remind our reviewers about their agreed deadline. Or, at least, prompt them to notify us where they're no longer able to complete a particular review, and allow us to seek an alternative scholar.

Naturally, effective academic communication is also reified within the pages of the research article itself, and reading around this subject is very much in the foreground of my current professional interests. However, that is a digression for another day. Let us turn instead to consider the articles which are appearing in this volume's pages.

Articles

This issue myself and the Editorial Board are delighted to bring you a number of original; research papers, and two of our very popular critical reflection and interview pieces. To open our issue, Ian Tan delves fascinatingly into James Joyce's Ulysses to explore the character Stephen's theories concerning Shakespeare's life and his work. By way of contrast, Tan argues that Girard's reading of Shakespeare in mimetic desire terms provides a far greater revelatory framework to comprehend both Joyce and Shakespeare's characters' motivations; especially as it relates to sexual desire (1).

Next, Victor Eze and Stellamaris Ejiofor present an empirical piece based within the Nigerian university system, examining issues around the acquisition of Chinese language by non-native speakers. Centred around the use of reading comprehension, the paper explores challenges for language learners in terms of adequate provision of support, staff and facilities. It also highlights the barrier learners' stress levels can provide to successfully learning this complex but increasingly globally important language (15).

Our next two articles originated from papers presented at the International Conference on Mechatronics Technology (**ICMT, 2017**). Firstly, Nguyen Huu Tho and colleagues take a detailed look at flexible manufacturing systems and the role biogeography-based optimisation can play in enhancing their processes. The paper also provides a detailed insight into the origins and principles of biogeography within the ecological field. Tho and colleagues progress this exploration by examining how this concept then came to be applied within engineering as a 'nature inspired algorithm', and moreover how it has been employed within their research (37).

Then, Mario Pisaturo and Adolfo Senatore take a look into electric motors and dry clutch control for mild-hybrid electric vehicles. Utilising some detailed simulation work, they examine two scenarios of vehicle launch manoeuvres and consider what lessons can be learned about restricting clutch overheating incidents for such vehicles (65).

Critical Reflection & Conversations

This issue closes with a pair of reflective articles. Firstly, and topically for everyone preparing for any major assessment of their research contribution, Isabelle Heyerick reflects on the relationships between academic public engagement and concepts of impact. She considers how recent practical workshop experiences with Flemish Sign Language interpreters directly impacted not only on the participants, but on her own research practice too. Heyerick draws some positive conclusions toward the bidirectionality of benefits from public engagement for the academy as well as the wider populace (82).

Finally, we are delighted to present another in our series of highly popular interviews with leading researchers about their careers, influences and thoughts on the wider scholastic landscape. This time it's Rebekah Vince and Hanna Teichler who are in conversation with Professor Bryan Cheyette, from the University of Reading. The trio's engagingly wide-ranging discussion touches on various aspects which include: Bryan's perceptions on the relationship between Jewish studies and colonial

studies, the role memory studies has played in his research, alongside key questions of interdisciplinarity in his work (94)

Corrections & Amendments

It has been brought to our attention in the article by Reed (**et al, 2017**) that the paper was published with a misspelling of contributing author's Rosina Borrelli's surname. Our apologies for this error, which has now been amended within the article's metadata and abstract. References to this work should likewise cite all authors by their correct names. Our thanks to Dr Borrelli for notifying us of the error.

Falsehoods, Misinterpretations & Factual Divergence: Thematic Call for Papers:

> *Truth is female, since truth is beauty rather than handsomeness; this, Ridcully reflected as the council grumbled in, would certainly explain the saying that a lie could run around the world before Truth has got its, correction, her boots on, since she would have to choose which pair - the idea that any woman in a position to choose would have just one pair of boots being beyond rational belief.* (**Pratchett, Unseen Academicals**)

We operate in an age where arguably verifying information or checking a fact is a swipe of a smartphone away almost anywhere on the planet. As scholars, we pride ourselves in the *veritas* embodied by our writing, research and learned discourse. Yet in the drive to achieve impact, recognition and career esteem we may find ourselves driven to publish 'positive' results, rather than less 'impactful' null outcomes. Are we as researchers as guilty as anyone else for skewing the potential conversations, counterpoints or controversial elements in our work, or even suppressing 'truth?' Given that political and public discourse seemingly besmirches the 'cult of expert', preferring to rely on hearsay, rumour and 'fake news', what are research literature and current thought telling us about the importance of avoiding fakery within our disciplines?

> *What kind of a world we'll have from now on, I don't know, I can't tell, but the world we know has been destroyed completely. Until now, every custom, every habit, every tiniest way of life has always taken a certain amount of privacy for granted, but that's all gone now.* (**Asimov, The Dead Past**)

Yet, are there moments when a 'ripe falsehood' can yield beneficial outcomes? Does it benefit the public if certain truths are withheld by the academy's scholars, or at least, not fully disclosed? When does a distortion actually represent a necessary simplification and when does it become a

problematic divergence from the factual base? Does a half-truth always equate to whole lie, or can genuine societal or cultural benefits be gleaned from omissions, misrepresentations or even full-blown falsehoods? Must empirical research always represent a quest for an objective reality, or is misrepresentation of insights in some way advantageous or constructive? Moreover, this is before considering how emerging technologies, such as AI, may already be reshaping public discourse and even cultural memory.

Hence, for the issue of *Exchanges* **to be published Autumn 2020**, we are inviting authors to submit original, exciting, insightful peer-reviewed research-based articles or critical reflections addressing some aspect of ***falsehoods, misinterpretations and factual divergences***: however, your research, perceptions or epistemology might wish to conceptualise them.

Exchanges especially welcomes articles tackling this topic by multiple authors with contrasting positions or from disparate fields. The Editorial Board, and myself, are delighted to discuss article concepts or outline ideas further.

The submission deadline is **Friday 1st May 2020**

General Submissions: Open Call for Papers

Additionally, *Exchanges: The Interdisciplinary Research Journal* **welcomes submissions 365 days a year** on any subject, outside of the requirements of our themed calls. We therefore invite manuscript contributions from researchers or practitioners from any discipline, anywhere in the world, which fulfil our **standard article format** requirements. We are happy to receive traditional research or review articles, but we also especially welcome submissions of **interviews with key scholars** or **critical reflections** on important scholarly events, conferences or crucial new texts. More information on all of these article formats are available on our website. Likewise, Editorial Board members are also available to further explore article ideas.

As *Exchanges* has a mission to support the development and dissemination of research by early career and post-graduate researchers, we are particularly pleased to receive manuscripts from emerging scholars and first-time authors. Please note, as our readership has strong interests in work which encompasses or straddles disciplinary boundaries, prospective authors are strongly encouraged to consider how their manuscripts address a broader, interdisciplinary audience.

Fees, Access & Author Rights

Exchanges is a diamond open access (**Fuchs & Sandoval, 2013**), scholar-led journal, which means there are no author fees or reader subscription charges. Authors also retain copyright over their work but grant the journal first rights of publication as a submission requirement. Contact any member of the Editorial Board or see our online guidelines for more information about submitting to *Exchanges*.

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Forthcoming Issues

The next regular issue of *Exchanges* is scheduled for April 2020, however, I strongly suspect there will be an additional issue of the journal published before then. Regular readers of this title, and our social media presence, will be aware of the work underway on two special issues. We anticipate the first of these, inspired by the 2018 ***Bites Here and There*** conference (**Warwick, 2018**), to be published early in the new year. Work is already well advanced on preparing this volume, with the help of my dedicated and hard-working associate editors: Giulia Champion, Fiona Farnsworth, Sophie Shorland, Freya Verlander, Nora Castle, Amulya Gyawali and Lorenzo Serini. My particular thanks to Giulia for her invaluable logistical support and unfailing enthusiasm for this exciting project.

Needless to say, as Editor-in-Chief, I'm always happy to discuss the potential for further special issues originating from within the post-graduate, early career researcher and interdisciplinary communities. Speaking of which, we still have an open call through to the **end of November 2019** for the subsequent special issue, this time derived from themes at the Utopian Studies Society conference this summer on ***Utopia, Dystopia and Climate Change*** (**USS, 2019**). We're looking for articles, reviews, interviews or critical reflections on this theme, within our normal author guidelines and for a multidisciplinary audience from scholars globally. You don't have to have attended the conference, if you've got something you would like us to consider including in the issue, please do consider submitting to what is likely to be a very exciting and highly topical volume. Full details for the call can be found here:

exchanges.warwick.ac.uk/announcement/view/17

In the meantime, the April 2020 normal issue of *Exchanges* will hopefully include contributions to a section dedicated to papers submitted on the theme of 'in-between spaces', along with our regular selection of other scholarly delights.

Acknowledgements

As always, my thanks to our authors and reviewers for their vital intellectual labour contributions towards creating this issue. Without you, the ability to produce a quality-assured, peer-reviewed, scholar-led publication would quite simply not be possible. Thanks also to our reader community, who play a key role in developing the debates and insights raised in each issue. I hope you find this issue as valuable and informative as previous volumes.

My particular thanks to the Editorial Board, for their input and comments, along with their dedication, focus and commitment they each bring to producing this interdisciplinary research organ. I'd like to welcome too the two recent editors to join us from Monash University, Sun Yee Yip and Quynh Ve, with whom the team are very much looking forward to working. I'd also like to acknowledge the former members of the Board, Dr Jane Connory and Dr Andrew Stones, who have departed for exciting new academic roles. We wish them well, although hope they remember their time with *Exchanges* fondly.

Practically, my thanks to Rob Talbot and Julie Robinson at the Warwick University Library, and Fiona O'Brien of the *Reinvention* journal for their continued guidance, technical insights and stimulating conversations.

Finally, my grateful thanks to our publisher, the Institute of Advanced Study at the University of Warwick for their continued financial and strategic backing for *Exchanges*.

Continuing the Conversation

In the meantime, don't forget to visit the editorial blog, follow our Twitter account or join our Linked.In group to keep up-to-date with *Exchanges'* latest news, developments and calls for papers. Please do join in the conversation, as we value hearing the thoughts of our author and readership communities. Alternatively, as editor-in-chief, I'm always delighted to discuss potential publications, collaborative opportunities or invites to talk publicly about *Exchanges*. Contact me via the email at the start of this article.

Editorial Blog: blogs.warwick.ac.uk/exchangesias/

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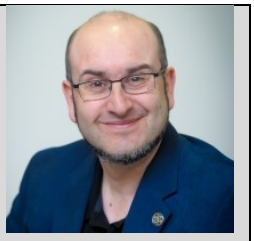

Gareth has been the Editor-in-Chief of *Exchanges* for two years, with a doctorate in cultural academic publishing practices (Nottingham Trent). He also holds various degrees in biomedical technology (Sheffield Hallam), information management (Sheffield) and research practice (NTU). His varied career includes extensive experience in academic libraries, project management and applied research roles. Currently, he also executive manages the Mercian Collaboration library consortium. His professional and research interests focus on power-relationships within and evolution of scholarly academic publication practice, viewed from within social theory and political economic frameworks. He is an outspoken proponent for greater academic agency through scholar-led publishing, and an expert in distributed team management and effective communication practice.

References

Brown, L., Griffiths, R., Rascoff, M., & Gutherie, K., 2007. University publishing in a digital age. *Journal of Electronic Publishing*, 10(3). Available at: http://dx.doi.org/10.3998/3336451.0010.301 [Accessed: 14 Oct 2019].

Fuchs, C., & Sandoval, M., 2013. The Diamond Model of Open Access Publishing: Why Policy Makers, Scholars, Universities, Libraries, Labour Unions and the Publishing World Need to Take Non-Commercial, Non-Profit Open Access Serious. *tripleC*, 11(2). Profit Open Access Serious. tripleC, 11(2). Available at: https://doi.org/10.31269/triplec.v11i2.502 [Accessed: 14 October 2019].

Gowers, T., 2017. The End of an Error? *TLS*, 24 October. https://www.the-tls.co.uk/articles/public/the-end-of-an-error-peer-review/ [Accessed 14 October 2019].

Hopes, A., 2013. The role and place of the academic is changing – and it's a good thing. *The Guardian*, 13 November. Available at: https://www.theguardian.com/higher-education-network/blog/2013/nov/13/academic-job-changing-flexibility-university [Accessed: 14 October 2019].

Hunter J., 2012. Post-publication review: opening up scientific conversation. *Frontiers in Computational Neuroscience*, 6, 63.

ICMT, 2017. 21st International Conference on Mechatronics Technology. October 20–23, 2017, Ho Chi Minh City, Vietnam. http://icmt2017.hcmut.edu.vn/ [Accessed: 14 October 2019].

Johnson, G.J., 2019a. *Comprehending Scholarly Journal Production: An Editorial Perspective*. Paper delivered at the "20th International Conference of the Utopian Studies Society, Europe" on 1st July at the Monash University Prato Centre, Tuscany, Italy. Available at: https://www.researchgate.net/publication/334318831_Comprehending_Scholarly_Journal_Production_An_Editorial_Perspective [Accessed: 14 October 2019].

Johnson, G.J., 2019b. *Deploying Sustainable Scholar-Led Publishing as an Early Career Researcher Training Exemplar*. Paper delivered at the "Vitae Researcher Development International Conference 2019" on 16th September at the Hilton Birmingham Metropole, Birmingham, UK. Available at: https://www.researchgate.net/publication/335859207_Deploying_Sustainable_Scholar-Led_Publishing_as_an_Early_Career_Researcher_Training_Exemplar [Accessed: 14 October 2019].

Leslie, D. 2005. Are Delays in Academic Publishing Necessary? *American Economic Review*, 95 (1): 407-413.

Morris, S., Barnas, E., LaFrenier, D., & Reich, M., 2013. *The Handbook of Journal Publishing*. Cambridge: CUP.

Nicholas, D., 2018. Early-Career Researchers Plant One Foot in the Future. *Research Europe*, 8th August. Available at: https://www.researchgate.net/publication/326776523_Early-career_researchers_plant_one_foot_in_the_future [Accessed: 14 October 2019].

Reed, K., Collier, R., White, R., Wells, R., Ingram, J., Borrelli, R., Haesler, B., Caraher, M., Lang, T., Arnall, A., Ajates-Gonzalez, R., Pope, H., Blake, L., & Sykes, R., 2017. Training Future Actors in the Food System: A new collaborative cross-institutional, interdisciplinary training programme for students. *Exchanges: The Warwick Research Journal*, 4(2). Available at: https://doi.org/10.31273/eirj.v4i2.161 [Access: 14 October 2019].

USS, 2019. *20th International Conference of the Utopian Studies Society, Europe: Utopia, Dystopia and Climate Change.* Available at: http://utopian-studies-europe.org/conference/ [Accessed: 14 October 2019].

Warwick, 2018. *''Bites Here and There'': Literal and Metaphorical Cannibalism across Disciplines*. Available at: https://warwick.ac.uk/fac/arts/hrc/confs/bites/ [Accessed: 14 October 2019].

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The Artist in and of the Work: Joyce's Artistic Self-Fashioning

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Abstract

This paper will explore the problematic link between biography and literature as it is self-consciously demonstrated by Stephen's theory about Shakespeare in the 'Scylla and Charybdis' episode of James Joyce's Ulysses. I argue how Stephen's construction of the link between Shakespeare's life and his work both illuminates and repeats a larger critical gesture between biography and literature. This is based on a mode of hermeneutical temporality which sees the present moment as containing within itself temporal fullness to be realised in a teleological fashion. However, Joyce's own ironic construction of Stephen, who disavows his own theorizing, should alert us as to how much we can take this theory at face value with respect to a character who invokes the name of Shakespeare as much to construct a theory of him as to deconstruct it. In response to this, I argue that Rene Girard's reading of Shakespeare in terms of mimetic desire provides a more compelling picture of the ways in which not only his characters, but the characters in Ulysses understand and articulate sexual desire as mediated by a prior belatedness patterned on the desire of the Other. However, I problematize Girard's reading of Shakespeare and Joyce, and my final contention is that the desire of reading and self-fashioning is set in motion not so much by mimetic recognition as it is by the Lacanian notion of misrecognition. This forms the discursive conditions of the articulation of that desire while irrevocably fracturing not only the Girardian idea of the triangulation of desire, but also the 'loop' of literature and biography by thwarting all attempts to speak and desire from the place of the Other, as the Other.

Keywords: James Joyce; Ulysses; Stephen Daedalus; William Shakespeare; Rene Girard

> *With the term thinker we name those exceptional human beings who are destined to think one single thought, a thought that is always "about" beings as a whole. Each thinker thinks only one single thought.*
>
> Martin Heidegger, Nietzsche, Volume III[i]

Responding to early criticism about prurient content of *Ulysses*, Joyce memorably remarked that if his novel was not worth reading, then by the same token, life was not worth living. The remarkable impression one gets from reading this novel, which is as much tethered to abstruse metaphysical speculation as it is to the flows of bodily functions, might help solidify an interpretive response of it being about life as it emerges from Joyce's own life. The irreducibly problematic link between biography and literature is self-consciously probed in the chapter of *Ulysses* titled 'Scylla and Charybdis'. Here Stephen Daedalus (the precocious artist figure modelled after Joyce himself) defensively advances a reading of Hamlet aimed at demonstrating how 'we walk through ourselves, meeting robbers, ghosts, giants, old men, young men, wives, widows, brothers-in-love. But always meeting ourselves' (**Joyce, 2001: 273**). Here Daedalus fuses a sometimes wilfully perverse biological speculation into Shakespeare's sexual life with his own musings about Aristotelean entelechy. He posits that a purposeful end shapes all parts of a single whole and conjures up a spectral image of Shakespeare which implicitly seeks to validate his own insecurities. He speaks about being begotten as a signifier of artistic belatedness, indexed in the conflation of the Bard's first name with the intentionality of artistic creation: 'They clasped and sundered, did the coupler's *will*. From before the ages He *willed* me and now may not *will* me away or ever' (**Joyce, 2001: 46-7, emphasis mine**).

My focus in this paper will be on exploring how Stephen's construction of the link between Shakespeare's life and his work both illuminates and repeats a larger critical gesture between biography and literature. This is based on an understanding of temporality which sees the present moment as containing within itself temporal fullness to be realised in a teleological fashion. The crucial link between Stephen and Hamlet, and by extension Joyce and Shakespeare, has of course been underlined by critics eager to centre upon 'Scylla and Charybdis' as providing an unambiguous presentation of Joyce's own theory of literary creation. The great Joycean critic Hugh Kenner unambiguously underlines that 'Joyce saw that the plot of the *Odyssey* and that of *Hamlet* were homomorphs, one concentrating on the father, one on the son', elevating the structural importance of Hamlet to be conterminous with Homer's epic (**Kenner, 1973: 33**).

Jennifer Levine goes one step further in her chapter on *Ulysses* in *The Cambridge Companion to James Joyce*, where she asserts that *Hamlet* displaces *The Odyssey* as the Ur-text for Joyce: 'Stephen may be cast as

Telemachus, but he thinks he is playing Hamlet' (**Levine, 1990: 123**). Richard Brown points to Shakespeare as forming a crucial source for Joyce's near obsession with adultery, a theme which not only conditions much of his creative work across genres (the short story collection *Dubliners* and the play *Exile* being meditations on betrayal in its various incarnations) but also framing his 'approach to the whole of the literary tradition' (**cited in Burham, 1990: 43**). Burham herself goes on to deliberately conflate Shakespeare and Bloom in her argument that 'Molly Bloom exhibits a … complexity of character by functioning both as Bloom's dark lady and his Ann Hathaway' (**Burnham, 1990: 44**). Indeed, Vincent Cheng notes that Joyce felt himself to be 'in a father-son relationship with Shakespeare' re-enacting the Freudian-Oedipal drama of literary usurpation which finds unambiguous expression in Stephen's meditation on familial consubstantiality in the chapter in *Ulysses* set in the National Library (**Cheng, 1984: 88**). These readings foreground the intertextual linkages between Shakespeare and Joyce which surface both within the text of *Ulysses* and Joyce's own investments in his literary characters being ironic models of past literary figures.

However, Joyce's own ironic construction of Stephen, who disavows his own theorizing, should alert us as to how much we can take this theory at face value. With respect to a character who invokes the name of Shakespeare as much to 'usurp his interlocutors' understanding of Shakespeare by pouring his poison 'in the porches of their ears' (**Joyce, 2001: 252**) as to situate himself enviously with regards to the literary father: 'My will: his will that *fronts* me' (**Joyce, 2001: 279, emphasis mine**). In as much as Joyce has Stephen weave his theory of Shakespeare from a wilful misreading of his life, he also deconstructs the critical urge to read literature from life and life from literature. As Kershner argues, 'Stephen the artist-critic here admits to the destructive aspect of the Janus-headed artist, god of his own creation' (**Joyce, 2001: 226**). In response to this, I argue that Rene Girard's reading of Shakespeare in terms of mimetic desire provides a more compelling picture of the ways in which not only his characters, but the characters in Ulysses understand and articulate sexual desire as mediated by a prior belatedness patterned on the desire which comes to us mediated by the demands of the unconscious Other. Extending the Girardian framework to encompass the desire of reading, as mediated by textuality, will also emphasise how the critical desire to interpret the life of Shakespeare/Joyce's text and the text of Shakespeare/Joyce's life. This is profoundly mimetic, as Joyce's fashioning of Stephen responds with repressed violence to Stephen's fashioning of Shakespeare's life, in a doomed attempt to fight over the body of Shakespeare's text, which is in Girard's theory is offered up in a sacrificial way. However, Girard's own theoretical framework is itself caught up in

what Jacques Derrida terms the equivocation between structure (of theory) and genesis (of artistic genius) which is endemic to any body of work, literary or philosophical. It is my final contention that the desire of reading and self-fashioning is set in motion not so much by mimetic recognition as it is by the psychoanalyst Jacques Lacan's notion of misrecognition, which fractures the symmetry of mimetic desire by implying how the recognition which stimulates desire is premised upon an unbridgeable gap in self-understanding. I thus take seriously the claim, seemingly neglected by critics who stress the homologies between Stephen, Joyce and Shakespeare, that rather than artistic reconciliation, 'Joyce restores sundering to the narrative of reconciliation' (**Wallace, 2005: 801**). It is thus the differences between author, literary characters and critic which *Ulysses* self-consciously asserts is the condition for interpretation. Ultimately, if the poststructuralist emphasis on the incommensurability of sign, structure and the self to their own hermeneutical sufficiency opens up questions of absence and the consequent possibilities of enunciation, 'Ulysses puts to the reader the question of the possibility of autobiography' (**Weinstock, 1997: 349**). In this way, I argue that *Ulysses* both raises and undermines the possibility of complete critical identification with the text. The critical desire to read literary production as a straightforward manifestation of an author's life (or indeed unconscious urges as demonstrated by psychoanalytical studies of literature) neglects to consider how this desire is motivated by a fantastic assumption of unity between biography and literature. Ironically, the gestures towards wholeness in *Ulysses* expose even more abysses.

Art which Contains Life: Stephen's Shakespeare as a model

Stephen's theory about Shakespeare announces itself not only as an aesthetic theory about the relationship between creator and text, adumbrated by Joyce in *A Portrait of the Artist as a Young Man* as the artist refining himself by turning the dross of reality into imperishable art, but as a theory about the life of the artist as text and the texts of the artist as figurations of the frustrations and imperfections of his life. Stephen's Shakespeare is fixated on the experience of being an exile, which resounds in the 'note of banishment, banishment from the heart, banishment from home' from his earliest plays to his last (**Joyce, 2001: 272**). Corrupted by Ann Hathaway who was much older than him 'in a cornfield' and betrayed by her with his brothers, Shakespeare becomes both bawd and cuckold (**Joyce, 2001: 244**). His art responds to his own personal failings by turning the events of his life into 'grist to his mill' the metaphor used suggesting both hard-won extraction and displaced aggression turned into aesthetic resentment (**Joyce, 2001: 262**). In Stephen's view, the details of

Shakespeare's life, seen in its totality through the lens of theory, becomes a text in which the 'boy of act one is the mature man of act five' (**Joyce, 2001: 272**). More than a begetting which compromises the creative artist through his contingent dependence upon the prior frailty of the flesh indexed through the legal fiction of paternity, the artist's life is something made, the intentionality of the act implying the actualisation of the possible, an ineluctability in which the 'signatures' of the artist can be found in 'all things I am here to read' (**Joyce, 2001: 45**). Just as Stephen ponders the consubstantiality of the Father and the Son as crucial to the aesthetic conception of Christianity, the texts of the artist and the artist's life form a closed structural economy without expenditure of loss. This structural model implies an investment in conceptualising the link between biography and literature which is repeated in biographies of Joyce and Shakespeare. The critic Gordon Bowker's illuminative biographical study of Joyce narrates Joyce's refraction of his own experience in the episode of young Stephen's breaking of his spectacles at Clongowes and his subsequent quest for redress in a way which could just have as easily emerged out of Portrait as from the biography, and Richard Ellmann's daunting biography James Joyce consistently interweaves events and locales of Joyce's life with the use he would make of them in the fiction. Indeed, King notes that Ellmann 'was a fastidious close reader of the autobiographical content in Joyce's writing' (**King, 1999: 300**). To prove his point, King cites a passage from Ellmann which positions Joyce as how Stephen positions Shakespeare:

> *The life of an artist, but particularly that of Joyce, differs from the lives of other persons in that its events are becoming artistic sources even as they command attention. Instead of allowing each day, pushed back by the next, to lapse into imprecise memory, he shapes again the experiences which shaped him* (**cited in King, 1999: 300**).

More interestingly, Park Honan's learned biography of Shakespeare claims Shakespeare was 'almost too much in the light' towards the end of his life due to his daughter Susanna's legal entanglements (**Honan, 1999**). In a gesture repeating Stephen's unresolved guilt towards his mother in *Ulysses*, 'Mary Shakespeare was involved with his deep understanding and his artistic faults, his exalting of Juliet or Rosalind, his odd failure with two different Portias, perhaps his blunder with Jessica, and with the curious misogyny evident in the Sonnets' (**Honan, 1999: 285**). Indeed, Honan's assertion that in composing *Othello*, 'the author might have found hints in his own temperament for his calculating, rational, improvising, and half-comic Iago, as well as for the self-dramatizing Moor' (**Honan, 1999: 316**). He finds another uncanny echo in Joyce's Stephen: 'His unremitting intellect is the hornmad Iago ceaselessly willing that the moor in him shall suffer' (**Honan, 1999: 273**).

No doubt the critical consensus is sound which sees not only a close link between the substance of an author's life with the textuality of his words, and the way in which Stephen crafts an image of Shakespeare which serves to validate his own desire to be the literary 'father of all his race' through supplanting the latter (**Joyce, 2001: 267**). The literary transaction between Joyce and Shakespeare is read by Kershner as such:

> *Joyce can deny that the historical Shakespeare has any importance except insofar as his image furthers [his] own art. Objectively, this is falsehood; but subjectively, it is necessity. Thus each artist "creates" his own Shakespeare* (**Kershner, 1978: 227**).

What is missing here is a recognition of the ways in which Joyce ironises Stephen through a comic undermining of his (and the critic's) model of reading. Indeed, I argue Ulysses underlines Joyce's scepticism towards any economy of closure and any hermeneutic gesture which sees textual signifiers as saturated with pre-determined meanings outside of the context(s) of reading. On the level of the word, Joyce demonstrates distortion and misreading: Molly mishears Bloom's references to Aristotle as 'Aristocrats Masterpiece' and comically misinterprets metempsychosis (**Joyce, 2001: 918**). Ironically this is the novel's master signifier for conservation and return. Bloom and others also mishear the word 'throwaway', which in the course of the novel gets distorted and misunderstood beyond recognition. If Sharpe is right to observe that in Ulysses, 'coition … implies an intercourse between the mind and things, between spirit and flesh, between the Son and the Father' (**Sharpe, 1963: 122**). Bloom's delight and guilt towards the act of masturbation can be interpreted as a sign of Joyce's ironic focus on sexual expenditure and implied death without possibility of actualisation. Indeed, if the notion of gestation undergirds both biological and artistic development, brought together significantly in the image of 'the transformation, violent and instantaneous, upon the utterance of the Word', then the ending of the chapter 'Oxen of the Sun' shatters any notion of teleology and 'final cause' through sheer textual excess. (**Joyce, 2001: 553**). As the chapter follows the historical the gestation of the English language, Joyce parodies any triumphalist or nationalistic assertion of a hegemonic form of the language by deforming it into uninterpretable and interminable street slang. As Kristeva notes in her essay *Powers of Horror: An Essay on Abjection*, Joyce's ultimate focus on the ironic apotheosis of maternal body is positioned as such:

> *[The feminine body] in its most un-signifiable, un-symbolisable aspect, shores up, in the individual, the fantasy of the loss in which he engulfed or becomes inebriated, for want of the ability to name an object of desire* (**Kristeva, 1987: 58-9**).

Joyce thus evokes a sense of structure only to destroy and fragment it—no easy Hegelian synthesis is possible between Shakespeare, Joyce/ Stephen and Ulysses, and life, writing and text. It will be more interesting to turn to a model of reading and interpretation which positions biography and textuality as contested spaces in which desire, and the desire to read, manifests through mimetic conflict. Girard's philosophy will provide us with a fascinating account of how interpretive intentionality is grounded on a certain repressed understanding of violence, and above all, envy.

Reading of the Text as the Drama of Desire: Girard's Shakespeare and Joyce

In his book *A Theatre of Envy*, the philosopher Rene Girard offers his theory about the relationships between the characters in Shakespeare's plays as defined by 'mimetic interaction' (**Girard, 2000: 256**). Crucial to Girard's larger anthropological insight is the fact that the desire of the subject is fundamentally imitative of the desire of the other person. Desire does not so much express the inner being of the subject as much as it is it entrenched in social relationships defined by envy, competition and aggressiveness. Patterned as it is on an external model, desire discovers both lack at the heart of being, and mediation with respect to how the Other channels our desire towards the same object. Taken as a theoretical model towards a biographical criticism of Shakespeare's artistic talent, Girard asserts that Stephen uncovers something fundamental in Shakespeare, which is not so much the source of artistic inspiration as it is the structural necessity of mimetic desire. Shaken by his first sexual encounter with Ann and his passivity in the affair, Shakespeare 'must beat Ann at her own game; he must win by her rules, thus making victory impossible' (**Joyce, 2001: 259**). As long as Shakespeare patterns his desire after Ann's desire, his plays demonstrate how characters use substitution, doubling and disguise to expose the repetition of desire and the violence which lies behind social relations. Extending his biographical criticism on Shakespeare onto Ulysses, Girard argues how Bloom and Stephen become unconscious rivals in mimetic competition for Molly:

> *Just like Stephen himself, Leopold Bloom, the hero of Ulysses, has a bad case of French triangulitis; he hates to be deceived but acts as if he loved it, baiting Stephen with suggestive pictures of Molly and inviting him his prospective rival to his home. Ashamed of being acted on, he wants to act, but all he achieves is co-authorship in the magnum opus of his own cuckoldry* (**Joyce, 2001: 263**).

Girard's analysis is enlightening as it offers both a psychological and structural account of inter-subjectivity and (as I later argue) intertextuality. Indeed, this model of reading can be productively mapped onto Ulysses in

terms of exploring how the articulation of the desires of Bloom, Molly and Stephen is necessarily grounded upon the construction of the desire of the other person. Stephen wonders about this dehiscence of the self in terms of the Other in him: 'I am other I now', which is manifested by his affecting to be Hamlet (reproducing the character's neuroses as a result) and his passive-aggressive reactions towards Eglinton and Russell who offer their own theories of Shakespeare in the National Library (**Joyce, 2001: 242**). Bloom's voyeurism and his anxiety are crucially linked to his inability to resume sexual relations with Molly, as he tries to find an imitative model of desire through the example of Blazes Boylan. Indeed, Girard's observations on Hamlet could as easily apply to Bloom: 'Hamlet must receive from someone else, a mimetic model, the impulse that he does not find in himself' (**Joyce, 2001: 276**). Indeed, if Bloom's androgyny signifies yet another form of imitative desire, Molly's musings about the male sexual organ make the aspect of mimicry and simulation comically explicit: 'I wished I was one myself for a change just to try with that thing they have swelling upon you so hard and at the same time so soft when you touch it' (**Joyce, 2001: 924**).

Extending Girard's framework towards the dynamics involved in the desire of reading will shed light on the uncanny repetitions which structure Stephen and other critics' readings of Joyce and Shakespeare. If Girard is right to assert that desire is engendered in imitation of previous models, then each critical gesture arises from mimetic impulses. More than this implication of structural homology, Girard's reading implies that the reader and/or critic of the text desires as Shakespeare and Joyce desires. The critical desire to read a literary text finds its pattern in other readings of the same text. The texts of both authors thus become contested spaces in which the will to assert originality through reading as the author read is ceaselessly undermined by the belated nature of repetition and mimicry, as indexed through Stephen's rejection of fatherhood as a 'conscious begetting' (**Joyce, 2001: 266**). For Girard, the logic of mimicry and the increased level of violence associated with it culminate in sacrifice, where violence is directed away from the competitors towards a sacrificial victim who appeases and annuls the violence before it becomes too destructive. Girard thus reads 'Scylla and Charybdis' as enacting a sublimated drama of mimetic violence and sacrifice by positioning Stephen and his interlocutors as fighting over their interpretations of Shakespeare. Stephen's disingenuous disavowal of his theory does not signal an overt diffidence, but an acute understanding of how to deflect escalating violence by concentrating it in the form of a sacrifice, the sacrifice in this instance being his own theory:

> *The author silences his own voice, yields the floor to his antagonists, and becomes a literary equivalent of his bawd-and-cuckold figure … Just as Joyce speaks of his own expulsion behind the mask of Stephen, [his] irony is seen, I believe, in the recurrent theme of the poet who becomes a preferential scapegoat in a world hostile to his art … in Joyce's text the collective victim is the one real poet in the entire group* (**Girard, 2000: 269**).

If we understand the text as sacrificial object, then it sublimates collective aggression by soliciting interpretations simulated by the original desire to read. It is no wonder that *Ulysses*, seen as a Bloomian text, itself dramatizes the logic of ritual sacrifice through the figure of the Wandering Jew who is put on trial, persecuted and who ultimately returns in the incarnation of the Word**.**

Girard's Misrecognition: Towards a psychoanalytic understanding of the detours of reading

However, if Girard's theory is yet another attempt to actualise what was potentially in the text through making theory adequate to the enterprise, thereby effecting a 'reconciliation', a more radical reading of the Joycean project will emphasise the 'sundering' which as Stephen says, precedes the critical re-appropriation (**Joyce, 2001: 247**). In an essay on the phenomenologist Edmund Husserl, Jacques Derrida notes how Husserl 'had to navigate between the Scylla and Charybdis on logicising structuralism and psychologistic geneticism' in negotiating the ultimately undecidable difference between the pre-existence of structure and the original event of birth (**Derrida, 1980: 158**). Read as a meta-commentary on theory, Girard's own philosophy necessarily equivocates between on the one hand reading the text as evincing the priority of theoretical structures (and thus being passive) and on the other hand, arising out of a spontaneous decision (and thus being active). This uncannily repeats Stephen's own equivocations between both his earthly and spiritual Fathers, for the aporia between critical exemplification and creative originality fragments the desire for closure and the imagined consubstantiality between Father and Son, text and theory. Indeed, Girard's discourse on Shakespeare is caught between elevating Shakespeare as a dramatic genius who uncovers the structure of mimetic desire in his plays, and Shakespeare's plays as needing Girard's own theories to fully become what they are as dramatic works. In this mise en abyme of recognising in the Other what belongs to the self, Girard senses his own victimization as sacrificial object:

> *In the meantime I had turned to mimetic desire and lectured about it to English-speaking audiences. The experience was always pleasant and yet, on some occasions, reminiscent enough of Stephen's to facilitate my understanding of the Joycean text. During the question period I was warned that my mimetic triangles, precisely because they are so exquisitely French, cannot really apply to English or American writers – least of all, of course, to the greatest of them all, William Shakespeare* (**Girard, 2000: 266**).

In this gesture of equating himself with Joyce, Stephen and Shakespeare, what Girard ultimately neglects to consider is Jacques Lacan's argument that the misrecognition of desire undergirds the subject's access to the symbolizing function of language. Lacan situates the origin of this misunderstanding at the moment when an illusory image of wholeness is presented to a child looking at himself or herself in a mirror. This fantastic prop is literally imaginary, for it is an image which structures the subject's understanding that he or she has a coherent personality. Desire is then always mediated by the Other, who ironically confirms the subject as unique individual by further displacing him or her away from the absent core of the self. In Ulysses, Joyce dramatizes moments of dislocation and misrecognition which mediate self-understanding. In a quest to supplant Shakespeare as artistic father, Stephen is confronted not with a mirror, but with a 'cracked looking-glass' and the figure of Hamlet is hopelessly refracted and distorted through various characters in *Ulysses* (**Joyce, 2001: 6**). Stephen assimilates Shakespeare only to distort him; as Richard M. Kain notes, 'Stephen, in his discussion, omitted all references here given to Shakespeare as a man in public life, or as a man with friends. Like Daedalus, Stephen's Shakespeare is lonely, embittered, an aesthete dedicated to "silence, exile and cunning"' (**Kain, 1964: 347**). Indeed, in texts which make explicit the presence of spectres, Bloom, Stephen and Hamlet must confront figures from their own families which, in their incommensurability with narrative and historical closure, destabilize the boundaries between life and death, past and present, and identity and non-identity. These breaks and detours further disrupt the desire for presence and completion. Reading this back into Joyce's life (thus accomplishing a critical mirror-image of Stephen's theorizing), Joyce's own ambiguous embracing and abjection of his mother, who in his mind stood for the unrelieved and unthinking grip of patriarchy and religion on the soul, functions as an unacknowledged creative source for the Irish émigré:

> *Joyce's mother, May Murray Joyce, suffered the decline of the family into poverty and her husband's drunkenness shored by her Catholic faith and her expectations that her eldest son James would find his vocation on the priesthood … The May Goulding Daedalus of Ulysses is even more memorable as the ghost haunting her profligate son whom*

> *he attempts to exorcise from his guilt-ridden consciousness … It was May Joyce's terminal cancer that brought her son back from his first attempt at self-exile in Paris when he was twenty-one* (**Bernstock, 1985: 9**).

Rather than a seamless integration and transubstantiation of the material of life into the mediated form of art, this potential for disruption and dislocation is recognised by Hansen. He states that 'Stephen's commentary attempts to disrupt Hamlet by allowing the ghosts of the material world that surrounded the text to disfigure the text itself' (**Hansen, 2001: 93**). Hansen later invokes the German cultural theorist Walter Benjamin's meditations on the differences between empty, homogenous time and Messianic time to emphasise that in Joyce's text, 'the ghosts of the past haunt the peripheries of history and must be made to disfigure the central text and its ontology of linear time' (**Hansen, 2001: 104**). I argue that Ulysses locates the many textual sites of disfigurement as examples of how the desire for closure and self-recognition can never be fully present and thus, fully represented.

In his book *Spectres of Marx*, Derrida argues that 'one never inherits without coming to terms with some spectre' emphasising how the spectre, exceeding presence and absence by coming back from the past, opens up the decision to read and to ground the desire for the text (**Derrida, 1994: 24**). The desire to read is thus fundamentally predicated upon the traces of memory and meaning which constantly remind us that time will always already be out of joint. Given that Shakespeare played the part of the Ghost in *Hamlet*, perhaps Shakespeare comes towards Stephen, Joyce and us as a ghost who needs to be reckoned with in our collective quests for self-fashioning and fulfilment. As Patricia Novillo-Corvalan reminds us, 'the memory of the spectre is neither capable of reproducing Shakespeare's genius nor offering a coherent narrative of his life; instead, it elicits further gaps, uncertainties, and the eerie, disturbing force of the supernatural' (**Novillo-Corvalan, 2008: 213-4**). Seen in this light, the desire of Stephen to speak from the place of the Other who is Shakespeare is fundamentally impossible, for the drama of misrecognition and identification is played out in purely imaginary terms: 'each imagining himself to be first, last, only and alone, whereas he is neither first nor last nor only nor alone in a series originating in and repeated to infinity' (**Joyce, 2001: 863**). Indeed, as James Maddox writes, Stephen's construction of Shakespeare in relation to himself betokens a desperate urge to ground an enduring self by finding a complete and coherence image of the mature artist within:

> *Stephen's concern with a perduring self as opposed to a succession of transient selves states in different terms the relation at the heart of the Shakespeare theory: the relation between the past that persists and the past that is left behind* (**Maddox, 1978: 106**).

King astutely exposes Stephen's posturing as signalling 'a schizophrenic anxiety over his identity, as defined by the measure of his sovereignty over the text', a mastery which is ceaselessly undermined by the spectral identity of Shakespeare and Shakespeare's text (**King, 1999: 302**). Cixous reminds us, 'Shakespeare is the name of a corpus, of an infinite, unlimited body without ego, without an absolutely identifiable owner' (**Cixious, 2012: 27**). Perhaps the most fitting image of the indissoluble link between misrecognition and the need to create the Other in the subject's own image is evoked in a moment in the hallucinatory sequence of the chapter 'Circe'. Here Shakespeare returns not as image, but as familiar nightmare, fracturing the boundaries between life and art:

> *(Stephen and Bloom gaze in the mirror. The face of William Shakespeare, beardless, appears there, rigid in facial paralysis, crowned by the reflection of the reindeer antlered hat rack in the hall)* (**Joyce, 2001: 671**).

To reiterate, this moment powerfully highlights how, the text will always return in the act of interpretation only on the condition that we misrecognise or misread it. The distorted image of Shakespeare reflects Stephen's critical desire to read him as cuckold at the price of a more profound betrayal. This is nothing less than the absolute otherness of what appears in the mirror, and thus by extension, allows itself to be read. The desire to find the author in the text, and to rescue the text from the author, opens up a vertiginous abyss which both warns and seduces the reader to read on.

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References

Bernstock, R. (1985). *James Joyce*. New York: Frederick Ungar.

Burnham, M. (1990). "Dark Lady and Fair Man": The Love Triangle in Shakespeare's Sonnets and "Ulysses". *Studies in the Novel*, (22)1, 43-56.

Cheng, V.J. (1984). *Shakespeare and Joyce: A Study of Finnegans Wake*. University Park: Penn State University Press.

Cixous, H. (2012). Shakespeare Ghosting Derrida. *Oxford Literary Review* (34)1, 1-24.

Derrida, J. (1994). *Specters of Marx*. Trans. Peggy Kamuf. London: Routledge.

Derrida, J. (1980). *Writing and Difference*. Trans. Alan Bass. Chicago: University of Chicago Press.

Girard, R. (2000). *A Theatre of Envy: William Shakespeare*. New York: Oxford University Press.

Hansen, J.A. (2001). The Uncreating Conscience: Memory and Apparition in Joyce and Benjamin. *Mosaic: An Interdisciplinary Critical Journal*, (34)4, 85-106.

Honan, P. (1999). *Shakespeare: A Life*. Oxford: Clarendon Press.

Joyce, J. (2001). *Ulysses: Annotated Student Edition*. Ed. Declan Kiberd. London: Penguin.

Kain, R.M. (1964). James Joyce's Shakespeare Chronology. *The Massachusetts Review*, (5)2, 342-355.

Kenner, H. (1973). *The Pound Era*. California: University of California Press.

Kershner, R. B., Jr. (1978). Artist, Critic and Performer: Wilde and Joyce on Shakespeare. *Texas Studies in Literature and Language*, (20)2, 216-229.

King, J. (1999). Trapping the Fox You Are(n't) with a Riddle: The Autobiographical Crisis of Stephen Daedalus in Ulysses. *Twentieth Century Literature*, (45)3, 299-316.

Kristeva, J. (1987). *Tales of Love*. Trans. Leon S. Roudiez. New York: Columbia University Press.

Levine, J. (1990). *Ulysses. The Cambridge Companion to James Joyce*. Ed. Derek Attridge. Cambridge: Cambridge University Press, 122-148.

Maddox, J.H., Jr. (1978). *Joyce's Ulysses and the Assault upon Character*. New Brunswick: Rutgers University Press.

Norvillo-Corvalan, P. (2008). Joyce's and Borges's Afterlives of Shakespeare. *Comparative Literature*, (60)3, 207-227.

Sharpe, G. (1963). The Philosophy of James Joyce. *Modern Fiction Studies*, (9)2, 120-126.

Wallace, N. (2005). Shakespeare Biography and the Theory of Reconciliation in Edward Dowden and James Joyce. *English Literature History (ELH)*, (72)4, 799-822.

Weinstock, J.A. (1997). The Disappointed Bridge: Textual Hauntings in Joyce's "Ulysses". *Journal of the Fantastic in the Arts*, (8)3, 347-369.

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[i] Editor's note: As can be found in for example: Heidegger, M. (1991). *Nietzsche*. San Francisco: Harper Collins.

Problems of Reading Comprehension in Learning Chinese As A Second Language Among Undergraduates of Chinese Studies in Nnamdi Azikiwe University, Awka, Nigeria

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Abstract

Several Chinese language teaching and learning centres are being established in Nigeria and around the world. There are Chinese government-funded institutions such as the Confucius Institutes in addition to Chinese language courses being taught through universities, colleges, private institutions as well as individual tutoring services. Learning a second language involves physical, intellectual and emotional commitment in order to successfully understand and interpret linguistic messages. However, certain problems could hinder understanding while learning a second language like Mandarin (Chinese Language). This study investigated the problems of reading comprehension in learning Chinese as a second language in Nigeria among students of Chinese Studies Department in Nnamdi Azikiwe University, Awka. Schemata theory of reading comprehension was employed as the theoretical framework of this research. The study surveyed fifty (50) Chinese Studies students by administering copies of questionnaire on them. Findings of this study revealed that the major problems students face in the study of Chinese language as foreign language are lack of adequate knowledge of Chinese vocabularies, reading stress and anxiety, wrong reading habits and lack of adequate infrastructures for reading. This study suggests that the government, the university authorities and language schools should provide adequate reading facilities to aid proper reading comprehension. Also, the language students should be counselled in order to diagnose their reading problems for appropriate solution.

Keywords: Chinese as a Second Language, reading comprehension, Nigeria, China, SLA, second language acquisition, Mandarin

Introduction

Language is a very important means of communication. It is very difficult to think of a society without language. It sharpens the thoughts and ideas of people and controls their activities. It is a carrier of civilization and culture. In the case of the mother tongue, the child learns it easily, due to the favourable environment and by the great amount of exposure to the language. But learning a second language requires conscious efforts and there are factors that affect the process of learning a second language, including attitude, self-confidence, motivation, duration of exposure to the language, classroom conditions, environment, family background, and availability of competent teachers (**Verghese, 2009**). The successful acquisition of a second language seems to some extent, contingent upon learners' views of the language learning environment, the learning situation, and how they view the target language and its speakers (**Narayan et al., 2008**). Like the environment and attitude, teacher's competence is also a factor that affects the second language learning. It is expected that a language teacher should be proficient in the language; the teacher's knowledge of and expertise in methods and techniques of language teaching should be of a reasonably high standard (**Verghese, 2009**).

Chinese as a foreign or second language refers to the studying of Chinese language by non-native speakers. There is an increasing interest in the learning of Chinese (Mandarin) as a second language globally. It is worthy to note that the teaching of Chinese both in China and outside of it has been an age long practice, dating back to 16th century. According to Liu (**2011**), about 670,000 people took Chinese Proficiency Test overseas in 2010. Many other countries are embracing the learning of Chinese languages. According to the BBC (**2006**), there was about a 57% increase in the number of English students who are taking Advanced Level (A Levels) exams in Chinese; with Brighton College, UK making Chinese one of their key [compulsory] subjects for study in 2006.

According to Lewis, Paul, Simons and Fennig (**2015**) the Chinese language family is the largest family in the world with around 1,197,000,000 total speakers. Lewis et al.'s study (**2015**) shows that the Chinese language family is separated into thirteen groups with the Mandarin Chinese group being the largest, with 848 million native speakers. Even when focusing solely on Mandarin Chinese it is still the most widely used language, by over double, with Spanish coming in as the second most spoken language in the world at 399 million speakers. Note that these statistics only consider native speakers of the language. Speaking Mandarin could, theoretically, allow one to communicate directly with the most native speakers. While the reach of Mandarin is quite large it goes beyond just

communicating to a large population. Mandarin is the sole official language of the People's Republic of China and Taiwan. It is also one of the four official languages of the Republic of Singapore and one of the six official languages of the United Nations. As such, Mandarin can be used to communicate with these nations and organisations at various levels.

China's status as an emerging world power, with a successful and expanding economy, presents a large opportunity for outsiders to benefit by engaging with different entities of the Chinese economy. Mandarin offers a better ground of understanding for outsiders to the country's economic community. Given the current opportunities and widespread use of the language the time for non-native speakers to learn Chinese, specifically Mandarin Chinese, has arguably never been better. Although the time is right for learning Chinese and many people are learning it, it is not without difficulties as it is considered one of the world's most difficult languages for non-native speakers to become proficient in, especially native English speakers. This study investigates the difficulties of reading comprehensions in the process of learning Chinese as a second language.

Statement of the Problem

Many views have arisen with respect to the problems that emanate in learning a second language. The most common cause of the problems faced by a learner of the Chinese language is the existence of inherent structure of their first language. A central theme in second language research is that of inter language, the idea that the language learners use is not simply the result of differences between the languages that they already know and the language that they are learning, but that is a complete system on its own with its own systematic rules. However, languages that a learner already knows can have a significant influence on the process of learning a new one. This influence is called language transfer. Thus, learners of new languages face a series of problems in the course of language learning. Underscoring the problems of learning Chinese as foreign language, Spencer (**2015: 33**) states:

> *Mandarin Chinese is an extremely complicated language with an ever-growing presence in the world. However, second language learners of Mandarin Chinese must contend with numerous difficulties on the journey to second language acquisition. Firstly, like learners of all foreign languages they must deal with general issues regarding SLA[i], such as stress, anxiety, different task types, speed related difficulties, vocabulary retention, and various other problems. Secondly, learners of Chinese also have to deal with many issues specific to Chinese, such as the many morphological differences*

> *between Chinese and other languages, acquisition of tones, and the complexity of the Chinese writing system.*

Although some researchers have carried out investigations on various problems of learning Chinese as a second language, their main focus has been on correct pronunciation, inability to understand or comprehend new words, problems of writing Chinese characters and inadequate listening skills. Based on the foregoing considerations, this research investigates the problems which Chinese language learners encounter while reading Chinese comprehensions among the undergraduates of Chinese studies department in Nnamdi Azikiwe University, Awka, Anambra State, Nigeria. Very few studies have assessed students of Chinese Studies students and their language acquisition processes in Nigeria. This study contributes to literature in that regard.

Research Questions

1. What are the reading problems encountered by undergraduates of Chinese Studies in Nnamdi Azikiwe University, Awka, Nigeria?
2. To what extent does insufficient knowledge of Chinese vocabulary affect reading comprehension among undergraduates of Chinese Studies in Nnamdi Azikiwe University, Awka, Nigeria?
3. To what extent does anxiety/stress affect the understanding of reading Chinese comprehensions among students in Nnamdi Azikiwe University, Awka, Nigeria?
4. How does lack of adequate Chinese reading infrastructures in the school affect the reading habit of Chinese learners in Nnamdi Azikiwe University, Awka, Nigeria?

Literature Review

The ultimate goal of any research into second language is to achieve an understanding of the concept of reading. For all students, foreign language learners in particular, reading has been the main channel for acquiring academic knowledge (**Akbari, Ghonsooly, Ghazanfari & Shahriari, 2017**). The problems of reading in studying a second language have received a larger attention over time. Empirical research has attempted to account for variables detailed by second language reading theories and provide an insight into second language reading problems. This review focuses on various studies on the problems of reading in a second language. Several scholars have extensively written and conducted research on reading comprehension and problems associated with it. For instance, Graham and

Bellert (**2009:71**), in the study titled *Reading comprehension difficulties experienced by students with learning disabilities*, noted that students with learning disabilities face various problems with reading comprehension in terms of (a) using background knowledge appropriately; (b) decoding and word recognition; (c) vocabulary knowledge; (d) fluency; (e) strategy use and metacognitive skills; and (f) differentiating between common text structures.

Highlighting the importance of vocabularies in reading comprehension, some scholars have found that poor performance in reading comprehension is often associated with gaps in the knowledge of vocabularies and lack of attention to developing language in most schools (**Scott, Jamieson-Noel & Asselin, 2003; Watts, 1995**).

According to Shirin (**2012**), the consensus among reading educators and experts is that reading is a complex, interactive process that involves features of readers, texts and tasks. In the reading process, the reader is an active participant, constructing meaning from clues found in printed text (**Bernhardt, 1991; Grabe, 1991**). In other words, meaning is not inherent in texts, rather texts have the potential for meaning. Reading is also an individual process that often entails different interpretations for different readers. Till now, the focus of research revolves on whether reading in one's first language (L1) is similar or different; if similar strategies are used in reading in L1 and L2[ii]. Researchers try to examine any relationship between L1 and L2 reading processes. Another hot issue is whether reading in L2 is a reading or a language problem; if the strategies used by proficient L1 readers are transferable to reading in the L2. Both reading in L1 and L2 involve the use of various strategies that assist readers in understanding what is read. Studies show that both readers' L1 reading ability and L2 language proficiency contribute to L2 reading comprehension (**Carrell, 1991; Bosser, 1992**).

Zhang and Anual (**2008**) investigated the role of vocabulary in reading comprehension among secondary school students learning English in Singapore. The study was carried out to ascertain the role of vocabulary in reading comprehension, which was based on the assumption students and teachers usually state that vocabulary is the biggest problem in reading. The scholars surveyed 37 year 4 secondary school students [iii] in a neighbourhood school in Singapore in their vocabulary knowledge vis-à-vis their reading comprehension and summary abilities. Findings of the study showed that the more vocabulary students know, the better their performance in reading competition.

Also, Ahmadi gilani et al (**2012**) state that a student's recognition of a text is dependent on both the student's linguistic knowledge, his/her general knowledge of the world and the degree to which that knowledge is

employed during processing. This refers to both knowledge and ability to contextualize it. Thus, reading comprehension is an interactive process between the reader and the text being read. The foregoing [ideas] align with the view of Carrel and Eisterhold (**1983**) that reading comprehension involves one's knowledge of the world, which may be culturally based and culturally biased. In other words, having background knowledge in a psycholinguistic model in learning second language offers a positive background for a better reading comprehension session.

Lau and Chan (**2003**) assessed the reading comprehension ability and the motivation variables of 83 good readers and 76 poor readers and found that the poor readers scored lower than good readers in employing all reading strategies and, especially in the use of sophisticated cognitive and metacognitive approaches. The scholars also found that poor readers had low internal motivation in reading that good readers. Though the employment of reading strategies had the strongest relation with reading comprehension, intrinsic motivation and strategy attribution could enable reading development through their positive relations with strategy use (**Lau and Chan 2003:1**).

Akbari, Ghonsooly, Ghazanfari and Shahriari (**2017**) examined 230 Iranian English language learners to find out the connection between L2 and L1 reading attitudes, and the degree L2 reading attitudes contribute to L2 reading achievement in an Iranian EFL[iv] context. The study found that L1 reading attitude has a strong correlation with L2 reading attitude, and that L2 reading attitude is significant for L2 reading achievement; thus developing a positive attitude among L2 learners and L2 readers is important.

Savic (**2015**) looked at the reading difficulties of young learners within an English as foreign language formal school setting in Serbia. The research took into consideration the fact that reading difficulties have negative effect on learners' self-esteem, attitude, motivation, confidence, academic and career prospects, and that the prevention of reading difficulties is an issue which requires effective action. The study involved 502 learners, aged 11, drawn from six state primary schools located in five geographically distant towns of Serbia. It found that reading difficulties in early EFL reading may have been the result of adverse effects of some individual and contextual factors, like poor linguistic and strategic competences of young learners, negative transfer of L1 literacy, inappropriate teaching approach, and insufficient exposure to L2 texts. A taxonomy of reading difficulties was complied, comprising 25 L2 reading difficulties

Lau (**2006**) investigated the difference between Chinese good and poor readers in their strategy use by using a think-aloud method. Eight grade 7 students in Hong Kong[v], four good readers and four poor readers, received a think-aloud task and an interview in the study. The study found that Chinese good readers employed more reading strategies and had better ability and knowledge of strategy use than the poor readers. The study also found that in addition to the cognitive deficiencies, poor readers were also found to have poorer intrinsic motivation than did good readers. This study underscored the fact that the combined problems of poor reading ability and motivation made it hard for poor reader to process the text at a higher level and thus easily gave up reading when they are faced with difficulties.

Anxiety and Stress were also pointed out as part of the problems in reading. For instance, Zhao, Dynia and Guo (**2013**) accessed the foreign language (FL) reading anxiety level of English-speaking university students learning Chinese as a foreign language in the United States[vi]. The study measured data from two anxiety measures, a background information questionnaire, and an email interview. It found that learners of Chinese experienced a level of FL reading anxiety similar to general FL anxiety. The FL reading anxiety was negatively linked with FL reading performance among Elementary Level I and Intermediate Level students but not among Elementary Level II students. Unfamiliar scripts, unfamiliar topics, and worry about comprehension were identified as the major sources of FL reading anxiety. The study showed that reading anxiety was a major problem for learners of Chinese whose native language was English.

Zhou (**2017**) investigated the foreign language reading anxiety of learners of Chinese as foreign language FL in the United States[vii]. It surveyed the background information of respondents and also interviewed them and found that there was no significant difference in reading anxiety level among four course levels. The study also found that Chinese L2 learners had a medium level of reading anxiety. It was noted that worries associated with comprehension, unfamiliar topics, unknown pronunciation, and feeling uncomfortable reading aloud were identified as major sources of FL reading anxiety (**ibid**).

Hidayati (**2018**) examined the problems faced by the first-grade students of senior high school of SMAN 1 Darussalam, Aceh Besar in reading comprehension. The findings of the study showed that many of the first-grade students of SMAN 1 Darussalam, Aceh Besar had problems in answering main idea, making inference, and locating reference questions. The most difficult aspect encountered by the students was finding main idea questions, because the located main idea was difficult to find. According to Hidayati, it was discovered that based on the students'

responses in questionnaire, they mostly had difficulties in understanding vocabulary, poor mastery of grammar, difficulties in understanding long sentences, a lack of media learning, less support from the family, and a lack of knowledge of strategies for reading comprehension.

Karanja (**2015**) tried to find out the extent to which reading problems affect the academic performance of secondary school student in public schools in Kiambus County, Kenya. Surveying both teachers of English and students, the study found students who had little difficulties with word substitution, omission, mispronunciation and addition scored high in their exam, while many of the teachers of English had problems in teaching reading. The study also found that 60% of the teachers did not conduct library lessons at all due to lack of library resources.

Theoretical Framework

This study is hinged on schema theory. Schema refers to an active organization of reactions or experiences (**An, 2013**). Gunning (**1996**) defines a schema as the organized knowledge that one already has about people, places, things, and events. Schema theory describes the interaction between what is in the text and how that information is shaped and stored by the reader. Its underlying assumption is that meaning does not lie solely in the print itself, but interacts with the cognitive structure or schemata already present in the reader's mind. Comprehension is making a sense out of text. It is a process of using reader's existing knowledge (schemata) to interpret texts in order to construct meaning. Many reading experts agree that the schema theory is one of the reasonable theories of human information processing.

Weng (**2009:134**) citing Clarke and Silberstein 1977 states that research has shown that reading is only incidentally visual. More information is contributed by the reader than by the print on the page. That is, readers understand what they read because they are able to take the stimulus beyond its graphic representation and assign it membership to an appropriate group of concepts already stored in their memories.

The implication of Schemata theory to reading comprehension is that all comprehension exercise entails the application of the reader's knowledge of the world as well (**An, 2013 citing Anderson, 1977:39**). According to Carrel and Eiserhold (**1983**), reading comprehension has a two-way operation which are from bottom up to the top and from the top down to the bottom of the hierarchy. Bottom-up processing is activated by specific data from the text, while top-down processing starts with general to confirm these predictions. These two kinds of processing are occurring simultaneously and interactively, which adds to the concept of interaction or comprehension between bottom-up and top-down processes. Thus, the

reading problems readers face has some foundation on their past knowledge and experiences as defined by their schemata.

Methodology

This study employs descriptive research design. Descriptive design studies are mainly concerned with describing events as they are without any manipulation of what is being observed. Any study which seeks merely to find out 'what is' and describes it is descriptive. The design is suitable to ascertain the problems of reading on the learning and proficiency in Chinese language of the BA Chinese students of Nnamdi Azikiwe University, Awka, Anambra state. The population of this study comprised of year I to year IV (final year) Chinese studies students of Nnamdi Azikiwe University.

This study was carried out through purposive sampling technique which sets out to select samples that have the trait required for the research. The four levels of students in the department of Chinese studies were selected for this study excluding the Confucius Institute students. The total population for this study was fifty (50) students, comprising of twenty (20) students from year I, ten (10) students from year II, ten (10) students from year III and ten (10) students from year IV (final year). The main instrument for the data collection of this study was self-administered questionnaire which was divided into five sections; A to E. Section A of the questionnaire investigated the reading problems among respondents; Section B investigated the knowledge of Chinese vocabulary among respondents; Section C focused on respondents' stress/anxiety level while reading Chinese comprehension; Section D captured respondents' reading habits and available reading infrastructure; and Section E focused on the demography of respondents.

Results and Discussion of Findings

The results of the analysis are presented in the sections below. Table 1 presents the demography of the respondents.

Table 1 Demographic Characteristics of the Respondents

	Variable	Measure	Frequency	Percent (%)
1.	**Sex**	Male	19	38
		Female	31	62
		Total	**50**	**100**
2.	**Age**	15-20 years	7	14
		21-25 years	43	86
		Total	**50**	**100**
3.	**Marital Status**	Single	46	92
		Married	3	6
		Separated	1	2
		Total	**50**	**100**
4.	**Class Level in School**	Year 1	13	26
		Year 2	19	38
		Year 3	8	16
		Year 4	10	20
		Total	**50**	**100**

Table 1 shows the demographic attributes of the respondents. The majority of the respondents (62%) were female while the male respondents accounted for 38% of the total sample; many of the respondents 43 (86%) fell within the age bracket of 21-25 years; also, majority of the respondents 46 (92%) were single while 6% were married, 2% were separated; most of respondents 19 (38%) were in Year 2, 26% of the respondents were in Year 1, 16% of them were in Year 3 while 20% of the respondents were in Year 4.

4.2 Presentation and Analysis of Research Questions

This section presents answers to the research questions. The various research questions are presented together with data analysis and discussion of findings.

Research Question 1: What are the reading problems encountered by Chinese students in Nnamdi Azikiwe University, Awka, Nigeria?

This research question shows the various problems faced by undergraduate students of Chinese studies department, Nnamdi Azikiwe University, Awka, Nigeria, in terms of reading comprehension. Table 2 presents the responses from the respondents.

Table 2 Reading Problems among Chinese Students in UNIZIK

S/N	Variable	Yes F (%)	No F (%)	I Don't Know F (%)	Total F (%)
1.	I have problem with understanding Chinese vocabulary	19 (38%)	30 (60%)	1 (2%)	50 (100%)
2.	I have problem with Chinese grammar	29 (58%)	20 (40%)	1 (2%)	50 (100%)
3.	My school has good Chinese library	17 (34%)	30 (60%)	3 (6%)	50 (100%)
4.	My department has reading laboratory	22 (44%)	25 (50%)	3 (6%)	50 (100%)
5.	I have good sight for reading Chinese comprehension	38 (76%)	11 (22%)	1 (2%)	50 (100%)
6.	Stress and anxiety affect my Chinese reading comprehension	23 (46%)	18 (36%)	9 (18%)	50 (100%)
7.	Poor grasp of Chinese culture affects my understanding	23 (46%)	22 (44%)	5 (10%)	50 (100%)

Table 2 shows that majority of the respondents or 30 (60%) stated that they did not have problem with understanding Chinese vocabulary; many of the respondents or 29 (58%) agreed that they have problems with Chinese grammar; 30 (60%) of the respondents stated that their school does not have a good Chinese library; 25 (50%) of the respondents stated that their school had no reading laboratory. Many of the respondents, 38 (76%), stated that they have good sight for reading Chinese comprehension, while 11 (22%) stated that they have sight problem. 23 (46%) of respondents agreed that stress and anxiety affected their Chinese reading comprehension. 23 (46%) of respondents noted that poor grasp of Chinese culture affected their understanding, while 22 (44%) of the respondents stated their poor grasp of Chinese culture did not affect their understanding.

Findings from the study showed that the reading problems among undergraduate students of Chinese Studies, UNIZIK [viii] are: Chinese grammar, lack of good Chinese library, lack of reading laboratory, stress and anxiety and poor grasp of Chinese culture. While many of the respondents do not have a problem with understanding Chinese vocabulary, the students face more problems that could hamper their understanding of reading Chinese comprehension.

The above findings are in line with the observation of Graham and Bellert (**2009:71**) which holds that some of the reading comprehension problems are (a) using background knowledge appropriately; (b) decoding and word recognition; (c) vocabulary knowledge; (d) fluency; (e) strategy use and metacognitive skills; and (f) differentiating between common text structures. Also, several other scholars have highlighted vocabulary deficiency as a problem in reading comprehension (**Scott, Jamieson-Noel & Aselin, 2003; Watts, 1995**). Similarly, some other researchers noted that stress and anxiety constitute problems in reading comprehension exercises (**Zhao, Dynia & Guo, 2013; Zhou, 2017; Hidayati, 2018**). In addition, Karanja (**2015**) suggested that inadequate Chinese reading infrastructures was a problem in reading comprehension. In all, the reading problems among undergraduate students of Chinese Studies at the Nnamdi Azikiwe University, Awka could affect students' understanding of Chinese comprehension. The students will perform better when the problems are solved.

> *Research Question 2: To what extent does insufficient vocabulary knowledge affect the understanding of reading comprehensions among Chinese students in Nnamdi Azikiwe University, Awka?*

This research question shows the degree to which insufficient vocabulary knowledge among undergraduate students of Chinese studies department, Nnamdi Azikiwe University, Awka affect their understanding of reading comprehension. Table 3 presents the responses from the respondents.

Table 3 Degree of Respondents' Knowledge of Chinese Vocabulary and Understanding of Reading Comprehension

S/N	Variable	VGE F (%)	GE F (%)	LE F (%)	NE F (%)	Total F (%)
1.	I learn new Chinese words always from my teacher	34 (68%)	14 (28%)	2 (4%)	-- (--)	50 (100%)
2.	I learn new Chinese words always from dictionary	32 (64%)	13 (26%)	4 (8%)	1 (2%)	50 (100%)
3.	I prefer reading comprehension in Chinese language	7 (14%)	18 (36%)	23 (46%)	2 (4%)	50 (100%)
4.	I understand Chinese words on their own	13 (26%)	12 (24%)	19 (38%)	6 (12%)	50 (100%)
5.	I understand Chinese words in comprehension passages	8 (16%)	25 (50%)	15 (30%)	2 (4%)	50 (100%)

Table 3 shows that most of the respondents 48 (96%) stated that to a great extent they learned new Chinese words always from their teacher, while 2 (4%) noted that to a little extent they learned new Chinese words always from their teacher. 45 (90%) of the respondents stated that to a great extent they always learned new Chinese words from a dictionary, while few of the respondents, 4 (8%), noted that to a little extent they always learned new Chinese words from a dictionary. 25 (50%) of the respondents stated that to a great extent they preferred reading comprehension in Chinese Language, while 23 (46%) stated that to a little extent they preferred reading comprehension in the Chinese Language. 25 (50%) of the respondents noted that to a great extent they understood Chinese words on their own, while 19 (38%) stated that to a little extent they understood Chinese words on their own. 33 (66%) of the respondents stated that to a great extent they understood Chinese words in comprehension passages, while 15 (30%) noted they understood Chinese words in comprehension passages. In addition, factor analysis exposed that there is a significant relationship between vocabulary knowledge and the understanding of reading comprehension (**Table 4**).

Table 4 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.638
Bartlett's Test of Sphericity	Approx. Chi-Square	52.805
	df	10
	Sig.	.000

Findings from the study showed that to a great extent the undergraduate students of Chinese studies department understand or learn new Chinese words from their dictionary and teachers. The words they have learned in this way help the students in understanding Chinese words, both when encountered alone and also when they are studying reading comprehension passages.

Supporting the findings of this study, some scholars have found that poor performance in reading comprehension is often associated with gaps in the knowledge of vocabularies and lack of attention to developing language in most schools (**Scott, Jamieson-Noel & Asselin, 2003; Watts, 1995**). In addition, the findings of this study are supported by the submission of Zhang and Anual (**2008**) which confirmed that that the more vocabulary students know, the better their performance in reading comprehension. Corroborating the findings of this study, Hidayati (**2018**) found that understanding vocabulary, poor mastery of grammar and the difficulty in understanding long sentences constitute problems in reading comprehension. In all, to a great extent, undergraduate students of Chinese Studies in the Nnamdi Azikiwe University, Awka need to have a good grasp of Chinese vocabulary in order to understand Chinese comprehension. The students' performance may improve if they possess a good knowledge of Chinese vocabulary.

Research Question 3: To what extent does stress/anxiety affect the understanding of reading Chinese comprehensions among students in Nnamdi Azikiwe University, Awka?

This research question shows the degree to which stress and anxiety affect the understanding of reading Chinese comprehension among undergraduate students of Chinese studies department, Nnamdi Azikiwe University, Awka. Table 5 presents the responses from the respondents.

Table 5 Degree of Respondents' Stress/Anxiety Level and Understanding of Comprehension

S/N	Variable	VGE F (%)	GE F (%)	LE F (%)	NE F (%)	Total F (%)
1.	I am always stressed while reading Chinese comprehensions	17 (34%)	15 (30%)	13 (26%)	5 (10%)	50 (100%)
2.	I am always anxious while reading Chinese comprehensions	19 (38%)	17 (34%)	11 (22%)	3 (6%)	50 (100%)
3.	Stress affects my understanding of Chinese comprehensions	20 (40%)	17 (34%)	9 (18%)	4 (8%)	50 (100%)
4.	Anxiety affects my understanding of Chinese comprehensions	16 (32%)	18 (36%)	13 (26%)	3 (6%)	50 (100%)

Table 5 shows that most of the respondents 32 (64%) stated that to a great extent they are always stressed while reading Chinese comprehensions, while 13 (26%) of the respondents stated that to a little extent they are always stressed while reading Chinese comprehensions. 36 (72%) of the respondents noted that to a great extent they are always anxious while reading Chinese comprehensions, while 11 (22%) of the respondents noted that to a little extent they are always anxious while reading Chinese comprehensions. 37 (74%) of the respondents stated that to a great extent their stress affected their understanding of Chinese comprehensions, while 13 (26%) of the respondents stated that to a little extent stress affected their understanding Chinese comprehensions. 34 (68%) of the respondents stated that, to a great extent, anxiety affected their understanding of Chinese comprehension, while 13 (26%) of the respondents stated that to a little extent anxiety affected their understanding of Chinese comprehension. In addition, factor analysis exposed that there is a significant relationship between stress/anxiety and the and the understanding of reading comprehension (**Table 6**).

Table 6 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.724
Bartlett's Test of Sphericity	Approx. Chi-Square	95.071
	df	6
	Sig.	.000

Findings from the study showed that to a great extent stress and anxiety affect the understanding of reading Chinese comprehension among undergraduate students of Chinese Studies in Nnamdi Azikiwe University. Thus, to a great extent, stress and anxieties affect the understanding of reading Chinese comprehension among students.

The above findings are in line with the findings of Zhao, Dynia and Guo (**2013**) in the study which examined foreign language reading anxiety level of English-speaking university students learning Chinese as foreign language in the United States. The scholars found that anxiety and accompanying stress affected the reading comprehension of students studying Chinese language. Unfamiliar scripts, unfamiliar topics, and worry about comprehension were identified as the major sources of FL reading anxiety (**ibid, 2013**). In addition, Zhou (**2017**) underscores that that worries associated with comprehension, unfamiliar topics, unknown pronunciation, and feeling uncomfortable reading aloud were identified as major sources of FL reading anxiety. All the aforementioned scholars agree that anxiety and stress constitute major problems in reading Chinese comprehension. In all, students who face stress and anxiety while reading Chinese comprehension will find it difficult to understand the passage. Understanding how to limit stress and anxiety could aid adequate understanding of Chinese comprehension.

> *Research Question 4: How does lack of adequate Chinese reading infrastructures in the school affect the reading habit of Chinese learners in UNIZIK?*

This research question shows how lack of adequate Chinese reading infrastructures in the school affects the reading habit of undergraduate students of Chinese studies in UNIZIK. Table 7 presents the responses from the respondents.

Table 7 Reading Infrastructure and Reading Habit of Respondents

S/N	Variable	Yes F (%)	No F (%)	I Don't Know F (%)	Total F (%)
1.	Lack of Chinese books in the library affects my reading habit	22 (44%)	23 (46%)	5 (10%)	50 (100%)
2.	Lack of Chinese library affects my reading habit	24 (48%)	21 (42%)	5 (10%)	50 (100%)
3.	Lack of Chinese reading sessions affects my reading habit	26 (52%)	20 (40%)	4 (8%)	50 (100%)
4.	My Chinese teacher's ability affects my reading habit	10 (20%)	36 (72%)	4 (8%)	50 (100%)

Table 7 shows that 22 (44%) of the respondents agreed that a lack of Chinese books in the library affected their reading habit, while 23 (46%) of the respondents disagreed. 24 (48%) of respondents affirmed that a lack of a Chinese library affected their reading habit, while 21 (42%) of the respondents disagreed. 26 (52%) of the respondents agreed that lack of Chinese reading sessions affected their reading habits, while 20 (40%) of the respondents disagreed. 10 (20%) of the respondents agreed that their Chinese teacher's ability affected their reading habits, while 36 (72% of the respondents disagreed.

Findings from the study showed that lack of reading infrastructures affects the reading habit of Chinese learners in UNIZIK, due to lack of books in the library, lack of Chinese library and the absence of reading sessions in the department. The respondents' Chinese teacher's ability does not affect their reading habit.

The above findings are in line with the findings of Karanja (**2015**) in the study which investigated the reading problems that affect students. The researcher found that inadequate Chinese reading infrastructure affect the students. The same study observed that many of the teachers did not conduct lessons due to lack of library resources in the school. In all, students' reading habit is hampered by unavailability of books and lack of Chinese library. There is also the factor of no reading sessions available to help improve the reading habits of students. Putting adequate infrastructures in place could improve the reading habits of students.

Conclusion and Recommendations

Researchers have investigated the various problems students face in reading comprehensions while learning Chinese as second language. This research was conducted in Nigeria and it investigated the problems of reading comprehension in studying Chinese as a second language among the undergraduates of Chinese Studies department in Nnamdi Azikiwe University, Awka, Anambra State. This study identified the various problems students face while reading Chinese comprehension and which appear somewhat generalizable to the students who are studying Chinese Language in Nigeria. This is based on the fact that they are likely to share the same socioeconomic circumstances and school terrain.

This study makes recommendation for various agents in the government and academic institutions. The government should adopt educational policies which will influence the lives of the students positively. This will include providing adequate infrastructures ranging from libraries, laboratories for reading and appropriate books. Academic scholars and institutions should embark on more training to ensure lecturers possess the skills needed that will translate positively into the educational lives of the students. More teacher-student counselling sessions should be mapped out by Chinese studies departments and other language study departments in order to identify how best to help students learn foreign languages.

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References

Ahmadi Gilani, M. R., Nizam Ismail, H. and Pourhossein Gilakjani, A., 2012. Impacts of Learning Reading Strategy on Student's Reading Comprehension Proficiency. *The International Journal of Language learning and Applied Linguistics World, (IJLLALW).* 1(1), December 2012.

Akbari, H., Ghonsooly, B., Ghazanfari, M. and Shahriari, H., 2017. Attitude Toward Reading: L1 or L2 or Both. *SAGE Open*. Available at: https://doi.org/10.1177/2158244017717303, [Accessed: 16 January 2019].

An, S., 2013. Schema Theory in Reading. *Theory and Practice in Language Studies*, 3(1), pp. 130-134. Available at: https://doi:10.4304/tpls.3.1.130-134, [Accessed: 20 January 2019].

BBC., 2006. *How hard is it to learn Chinese.* Available at: http://news.bbc.co.uk/2/hi/uk_news/magazine/4617646.stm, [Accessed: 10 January 2019].

Bernhardt, E. B., and Kamil, M. L., 1995. Interpreting Relationships between L1 and L2 Reading: Consolidating the Linguistic Threshold and the Linguistic Interdependence Hypotheses. *Applied Linguistics*. 16(1), pp. 15–34.

Bossers, B., 1992. *Reading in Two Languages: A Study of Reading Comprehension in Dutch as a Second Language and in Turkish as a First Language*. Rotterdam: Drukkerij Van Driel.

Carrel, P. L., 1991. Second language reading: Reading ability or language proficiency? *Applied linguistics*, 12, pp. 159-179.

Carrell, P. L. and Eisterhold, J. C., 1983. Schema theory and ESL reading pedagogy. *TESOL Quarterly,* 17(4), pp. 553-573. Available at: https://doi.org/10.2307/3586613, [Accessed: 16 November 2018].

Grabe W., 1991. Current developments in second language reading research. *TESOL Quarterly*, 25(3), pp. 375-406.

Grabe, W. and Stoller, F. L., 2002. *Teaching and Researching Reading.* London: Pearson Education Longman.

Graham, L. and Bellert, A., 2009. Reading comprehension difficulties experienced by students with learning disabilities. *Australian Journal of Learning Disabilities*, 10(2), pp. 71-78. Available at: https://doi.org/10.1080/19404150509546791, [Accessed: 18 August 2018].

Gunning, T. G., 1996. *Creating Reading Instruction for All Children.* Chapter 6, pp. 192-236. Available at: https://eric.ed.gov/?id=ED393073, [Accessed: 21 August 2018].

Hidayati, D., 2018. *Students Difficulties in Reading Comprehension at the First Grade of SMAN 1 Darussalam Aceh Besar.* B. A. Dissertation, Ar-Raniry State Islamic University, Darussalam –Banda Aceh.

Karanja, W., 2015. *Effects of Reading Difficulties on Academic Performance among Form Three Students in Public Secondary Schools, Kiambus County, Kenya*. M. A. Dissertation, School of Education, Kenyatta University, Kenya.

Lau, K., 2006. Reading strategy use between Chinese good and poor readers: a think-aloud study. *Journal of Research in Reading*, 29(4). Available at: https://doi.org/10.1111/j.1467-9817.2006.00302.x, [Accessed: 20 August 2018].

Lau, K. and Chan, D. W., 2003. Reading strategy use and motivation among Chinese good and poor readers in Hong Kong. *Journal of Research in Reading*, 26(2). Available at: https://doi.org/10.1111/1467-9817.00195, [Accessed: 16 October 2018].

Lewis, P. M., Simons, G. F., and Fennig, C. D. (eds.)., 2015. *Ethnologue: languages of the world.* 18th edn. Dallax, TX: SIL International. Available at: http://www.ethnologue.com, [Accessed: 19 June 2018].

Liu, l., 2011. *Chinese language proficiency test becoming popular in Mexico*. Available at: http://www.xinhuanet.com//english2010/china/2011-06/27/c_13951048.htm, Visited on 12.08.2018, [Accessed: 12 December 2018].

Narayana, S., Jacks, A., Robin, D. A., Poizner, H., Zhang, W., Franklin, C., Liotti, M., Vogel, D. and Fox, P. T., 2009. A Non-Invasive Imaging Approach to Understanding Speech Changes following Deep Brain Stimulation in Parkinson's Disease. *American Journal of Speech-Language Pathology*. 18(2), pp. 146-161. Available at: https://doi:10.1044/1058-0360(2008/08-0004, [Accessed: 18 December 2018].

Savic, V., 2015. *Reading difficulties in English as a Foreign Language.* Ph.D Thesis, Faculty of Arts, University of Novi Sad. Available at: http://nardus.mpn.gov.rs/bitstream/handle/123456789/8156/Disertacija9371.pdf, [Accessed: 11 January 2018]

Shirin, S. E., 2012. *Reading Strategies of Iranian Postgraduate English Students Living at ESL Context in the first and Second Language.* Proceedings of the International Conference on Education and Management Innovation, IPEDR, 30, pp.195-199.

Scott, J. A., Jamieson-Noel, D., and Asselin, M., 2003. Vocabulary instruction throughout the day in twenty-three Canadian upper-elementary classrooms. *The Elementary School Journal*, 103(3), pp. 269–283. Available at: https://doi:10.1086/499726, [Accessed: 10 January 2019].

Spencer, W. A., 2015. *Mandarin Chinese as a Second Language: A Review of Literature, Honors Research Projects submitted to The University Of Akron*. Available at: http://ideaexchange.uakron.edu/honors_research_projects/210, [Accessed: 20 January 2019].

Verghese, P. C., 2009. *Teaching English as a second language*. 9th edn. New Delhi: Sterling Publishers.

Watts, S. M., 1995. Vocabulary instruction during reading lessons in six classrooms. *Journal of Reading Behavior*, 27(3), pp. 399–424.

Xiaohong Weng, X., 2009. Teaching Listening and Speaking: An Interactive Approach. In Everson, M. E., Cheng, X. Y. and Tsui. eds., *Teaching Chinese as a Foreign Language: Theories and Applications*. Cheng & Tsui Company.

Zhang, L. J. and Anual, S. B., 2008. The Role of Vocabulary in Reading Comprehension: The Case of Secondary School Students Learning English in Singapore. *RELC Journal*, 39(1). Available at: https://doi.org/10.1177/0033688208091140, [Accessed: 23 February, 2019].

Zhao, A., Dynia, J. and Guo, Y., 2013. Foreign Language Reading Anxiety: Chinese as a Foreign Language in the United States. *The Modern Language Journal*, 97(3), pp. 764-778. Available at: https://www.jstor.org/stable/43651704, [Accessed: 23 February 2019].

Zhou, J., 2017. Foreign language reading anxiety in a Chinese as a foreign language context. *Reading in a Foreign Language*, 29(1), pp. 155-173.

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Endnotes

[i] Second language acquisition

[ii] Any non-native spoken, acquired second language

[iii] ~15-16 years old

[iv] English as a foreign language

[v] ~12-13 years old

[vi] n = 114

[vii] n = 76

[viii] Nnamdi Azikiwe University

Multi-objective Production Planning for a Flexible Manufacturing System based on NSBBO Method

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Abstract

The dramatic expansion in the global manufacturing market has created a demand for small and medium enterprise (SME) to apply the advanced manufacturing technology (AMT). The flexible manufacturing system (FMS) is considered as a highly competitive manufacturing strategy to ensure the success of the enterprises in the developing countries. The implementation of FMS, however, is an intractable task that requires complete integration of numerous components from various vendors. This paper presents a multi-objective production planning model for selecting the most suitable combination of machines and operations in machining processes to simultaneously minimize the system unbalance, makespan (MK) and total flow time. The proposed model considered the capacity of machines, tool magazines, batch sizes, processing time and the time taken to transport machining parts. Moreover, it also considered the different allocation of each part of batch into various machines. The principle of biogeography-based optimization (BBO) is adapted to explore the possibilities of attaining feasible solutions for a formulated problem. The most appropriate solutions in selecting the machine and operation allocation were determined based on non-dominated sorting BBO procedure (NSBBO) and validated by FlexSim simulation environment. The obtained results highlighted the practical applicability in the implementation of FMS.

Keywords: FMS; flexible manufacturing system; production system automation; production system planning; production scheduling; NSBBO; simulation; biogeography-based optimization; BBO

Introduction

The globalization process, improving the product life cycles, satisfying the complex customer demands, and increase in the labor cost has motivated manufacturers to be more innovative, responsive, adaptive and flexible. Advanced manufacturing technology (AMT) has a potential to be implemented in small & medium enterprises (SME) to maintain productivity. Production planning is the heart of smart management in SMEs for implementation of production systems with desired production goals (minimizing average lateness, minimizing the makespan (MK), maximizing utilization, minimizing work-in-progress and setup time, minimizing tardiness and flow time). The batch size has ever reduced, and the typical customer demands on flexibility have made the Flexible Manufacturing System (FMS) become a competitive production strategy of the late twentieth century (**Udhayakumar & Kumanan, 2010**). FMS has become an important element in the success of manufacturing enterprises in the last decade (**Candan & Yazgan, 2015**). FMS is an innovative manufacturing strategy that has generated attention to be implemented in SMEs. FMS, which is an automated manufacturing system with job shop flexibility and flow shop efficiency, has the benefits of high machine utilization, requiring fewer machines thus reducing floor space utilization, ability of responding to changeability, ease of reconfiguration and agility, reduced inventory requirements, less labor-intensive, and opportunity for automated production (**Groover, 2016**). Moreover, the integration of manufacturing methods and technologies caused the FMS to obtain other advantages such as reduction of work-in progress and cost, minimized setup time, minimized flow time and idle time for resources, minimized changeover time, minimized material handling time, shorten lead times, simplification of manufacturing, reduced floor space utilization, improved quality and market responses, etc. (**Udhayakumar & Kumanan, 2010**). FMS is an effective manufacturing unit that is expensive, thus managing the system is extremely important to achieve the desired performance of utilization and reducing the risk of investment (**Abazari, Solimanpur, & Sattari, 2012**). FMS is a profound approach to attain significant benefits for manufacturing economies. Thus, the formation of FMS is a step towards flexibility, shifting to quick response in producing high quality parts at low cost and satisfying the customer's demand (**Sujono & Lashkari, 2007**). In particular, production planning related to the production planning problem should be the first-key to be considered when implementing the FMS in practice. Machine selection and production planning strongly affect the system's efficiency and productivity (**Mahmudy, Marian, & Luong, 2013**). Due to the high investment required, higher resource utilization must be achieved, and this matter can be addressed by establishing a good production planning

to increase productivity and flexibility (**Mahmudy et al., 2013**). The decisions on production planning must be implemented before the start of the actual production (**Chen & Ho, 2005**). Multiple objective production planning is one of the most crucial aspects of the desired effective utilization with the aim of reducing the manufacturing costs at least by 10-30% and material handling costs at least by 10-70% (**Abazari et al., 2012**).

Literature Review

Production planning problems involve the issues of selecting the machines and operations to produce many different part types within technological and capacity constraints. The production performance is no longer determined by manufacturing cost as other factors (quality, flexibility, delivery, and customer services) play a more important role in the success of enterprises. The characteristics of flexibility, efficiency, and quality are vital to improve the manufacturing systems. The FMS is an automated manufacturing system that has the flexibility of a job shop while retaining the efficiency of a flow shop to produce many part types with different small-to-medium size batches. The duality of efficiency and flexibility complicates the management of FMS and this is reflected in the planning as well as scheduling (**N. Kumar & Shanker, 2000; M. Tiwari, Rika, Rthi, Jaggi, & Mukhopadhyay, 1997**). For production facilities, an FMS comprises many machines, a material handling system and a central storage system. Use of FMSs lead to: (1) increase in product variety, (2) shorten product development cycle, (3) increase flexibility and adaptability to the changes in the market, (4) improve the utilization of resources, (5) increase productivity and reduce costs of goods and services, (6) reduce setup time and work-in-progress (WIP), (7) create rapid cell for new product family by reprogramming simply FMS (**Gamila & Motavalli, 2003**). FMS is being implemented in developing countries due to its flexibility and possibility to increase efficiency up to 90% (**Vidyarthi & Tiwari, 2001**). Production planning for FMS is more difficult than in job shops. This is because: (1) the machine is more flexible and able to process many operations, (2) several part types can be processed simultaneously, and (3) each part type may have more than one production route. In particular, sequencing of part types, operation allocation, and reallocation of part types are the three main concerns (**Vidyarthi & Tiwari, 2001**). Solution for production planning may affect the optimal operation of FMS.

To solve the production planning, many researchers have developed the different methods which comprise of mathematical modeling, simulation, evolutionary computation, and artificial intelligence. For instance, (**Tiwari et al. 1997**) presented a heuristic method based on the 'shortest processing time' (SPT) sequencing and Petri Nets for machine loading problem (MLP) in FMS with the aims of decreasing the system unbalance

(SU) and maximizing throughput. (**Kumar, Singh, and Tiwari, 2004**) also proposed a fuzzy-based method with three main constituents, involving the determination of job sequencing, allocation of operation and reallocation of jobs. Kumar and Shanker (**2000**) applied the GA for selecting the part type and loading machine in FMS. Atmani and Lashkari (**1998**) built a linear integer programming model of selecting machine and allocating operation in FMS to minimize the total production costs. Mukhopadhyay, Singh & Srivastava (**1998**) considered the MLP in FMS using simulated annealing algorithm (SA) to minimize the system imbalance. Biswas and Mahapatra (**2008**) presented the modified particle swarm optimization (PSO) to minimize SU while satisfying the constraints of processing time and tool slots. Vidyarthi and Tiwari (**2001**) developed a heuristic solution based on fuzzy sets for MLP with minimizing the system unbalance and maximizing throughput. With the same objectives, Sarma, Kant, Rai, & Tiwari (**2002**) developed a framework with a mixed integer programming (MIP) model based on the fixed part sequencing rules and Tabu Search (TS) algorithm. Swarnkar and Tiwari (**2004**) used a hybrid approach of TS and SA for solving the MIP model. Kumar, Tiwari, Shankar & Baveja (**2006**) presented the constraint-based GA to solve a complicated variety of variables and constraints in MLP. Their work is extended by Tiwari, Kumar & Shankar (**2006**) using an approach based on constraint-based fast Simulated Annealing (SA). Prakash, Khilwani, Tiwari & Cohen (**2008**) developed a more effective immune algorithm (IA) with decreased memory demands and computation complexity for selecting the job and allocating the operations in FMS. Prakash, Tiwari and Shankar (**2008**) proposed an adaptive hierarchical ant colony algorithm for resolving the traditional MLP in FMS. Mandal, Pandey and Tiwari (**2010**) discussed a mathematical model for the MLP in FMS in the occurrence of technological constraints using a hybrid approach of GA and SA. Kumar, Murthy & Chandrashekara (**2012)** continued solving the MLP using GA and PSO. Prakash, Shukla, Shankar and Tiwari (**2007**) provided the approaches of artificial intelligence (AI) for solving the MLP of FMS. Besides, Goswami and Tiwari (**2006**) also presented an approach based on reallocation to handle the MLP.

Gamila and Motavalli (**2003**) analyzed the production planning in FMS and solved the loading and scheduling of parts and tools. Nagarjuna, Mahesh and Rajagopal (**2006**) developed the heuristic method for MLP in random type FMS based on multistage programming to minimize system unbalance (SU). Arikan and Erol, (**2006**) developed meta-heuristic based on SA and TS for solving the part selection and tool allocation to determine the minimum number of parts in a batch. Moreover, their work is also extended by themselves (**Arıkan & Erol, 2012**) to minimize the system unbalance using a hybrid of SA TS. Goswami, Tiwari and Mukhopadhyay

(**2008**) discussed the integrated solution to address tool-part grouping, allocation and scheduling of jobs in FMS. Rai, Kameshwaran and Tiwari (**2002**) presented the model of MLP in FMS to minimize the total cost using a fuzzy goal programming. Then, the proposed fuzzy goal programming model is solved with ant colony optimization by Chan and Swarnkar (**2006**), a quick converging simulated annealing-based solution by Mishra, Prakash, Tiwari, and Lashkari (**2006**), and an artificial immune system (AIS) by Chan, Swarnkar and Tiwari (**2005**).

Tiwari, Saha and Mukhopadhyay (**2007**) combined the job sequencing and MLP in FMS using two heuristics. Yang and Wu (**2002**) proposed the MIP model to integrate part type selection and MLP using GA. Mandal, Pandey and Tiwari (**2010**) solved the traditional production planning with consideration of machine breakdown in predetermined and stochastic cases of dynamic manufacturing environment. Koşucuoğlu and Bilge (**2012**) solved the FMS loading with consideration of material handling system. Guldogan (**2011**) proposed an integrated model of expert system based on knowledge engineering and the GA for MCDM in solving the MLP. Jahromi and Tavakkoli-Moghddam (**2012**) proposed a dynamic model of machine and operation selection problem with consideration of the movement policies of part and cutting tool in FMS. Basnet (**2012**) proposed a hybrid GA for making decisions to allocate the machines and cutting tools to different jobs in FMS. Abazari, Solimanpur and Sattari (**2012**) proposed a mixed linear programming model for job selection and allocation of operation in FMS to obtain the maximum utilization and profitability using GA. Chen and Ho, (**2005**) proposed a novel technique to production planning in FMS based on an efficient multi-objective GA (EMOGA).

Das, Baki, and Li (**2009**) solved the production planning of FMS involving the allocation of cutting tools, part type grouping, and production planning using LINGO. Shin, Park, and Kim (2011) presented a multi-objective symbiotic evolutionary algorithm to solve the multi-objective process planning in FMS. Soolaki and Zarrinpoor (**2014**) proposed a new model of assignment problem in flexible manufacturing system. Many objectives are used in solving the MLP such as production cost (comprises of machining costs, traveling costs, setup costs, loading and unloading time, and storage time), SU, TH, makespan, movement of cutting tools, part types, AGV (Automated Guide Vehicle), etc. The system unbalance is correlated with the throughput. Minimization of SU will cause the throughput to be in maximum value. However, few other objectives that have gathered only a little attention when considering MLP: makespan and total flow time when to consider the MLP. Therefore, it is clear that the MLP needs to be paid more attention to and more exploration needed to be done enable it to be applied in the real industry, especially in manufacturing SMEs. In this study, the proposed approach of combination

of biogeography based optimization (BBO) and non-dominated sorting is presented for multi-objective production planning problem in FMS.

Mathematical Model

FMS with limited numbers of CNC machines (usually less than 25) is the key component to the implementation of manufacturing systems. The structure of FMS consists of CNC machine tools (with the automatic tool magazines), robot for loading/unloading parts and a conveyor handling system. The loop layout ensures the parts to flow smoothly to the machine position. After the part is machined and became the finished product, it is unloaded from the machine and moved to the drop-off position by loop conveyor. Figure 1 shows the structure of proposed FMS.

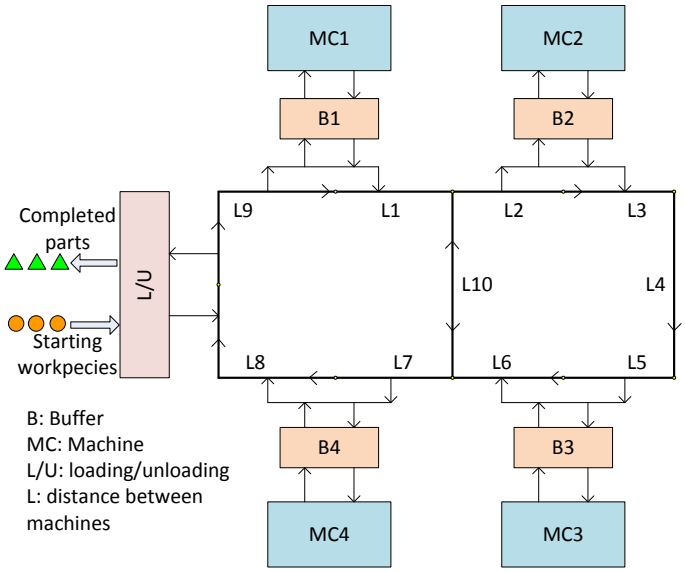

Figure 1. Flexible Manufacturing System

The production planning problem is identified as how the parts are to be assigned into the various CNC machines to obtain the manufacturing goals with the technological constraints and machine capacity addressed. The balancing of workload or minimizing system unbalance has been popular in conventional systems and FMS, which is the attempt to allocate equal total processing times to each CNC machine. The reason is that if the workload is uniform, congestion will be reduced and the performance will be improved. So this objective ensures that all machines in the system complete the desired operations more or less at the same time. Therefore, minimization of system unbalance is very important in reconfiguring the system to produce a new batch of part types (**Stecke & Solberg, 1981**).

Minimization of transportation time as well as minimization of the number of part type movements will make the workload unbalanced with the longer queue at the heavily used machines. If the transportation time in the system is larger compared to the processing time of operations, this objective is then worth considering. The managers always look for the way to assign several consecutive operations on a machine with the aim of balancing.

The purpose of this paper is to explore the most suitable allocation of operations into machines to satisfy the manufacturing goals, which are presented as the objective functions: minimization of (1) system unbalance, (2) makespan and (3) total flow time.

The below assumptions are used to analyze the FMS planning problem. A part of the assumptions is adapted from Atmani and Lashkari (**1998**) and Mukhopadhyay (**et al., 1998**):

-The type of machines and the number of machines in FMC are pre-determined. All the machining parts are processed in the same manufacturing facility.

-The raw materials and cutting tool prepared for processing are available when needed.

-All of machines and part types are simultaneously available. A part type comprises of several operations. A number of parts are produced simultaneously in batches. Parts can be selected and processed in one or more machines.

-A machine can perform multiple functions of milling, drilling, boring, turning, reaming, etc. and an operation can be processed on potential machines equipped with the required tools.

-The part processed on responding machines must be completed before continuing another part.

-All data on the process plan are available.

-Loading, unloading and setup times are included in processing time or negligible.

-The tool magazine slots are not allowed to be shared and to duplicate the cutting tools.

-All the design, structure of the layout and setup problems in FMS has been pre-determined.

-Real-time problems involving congestions, traffic control, breakdown, electricity, scraps, rework, failure of equipment, the shortages of materials and maintenance are ignored.

Notation

The following is a list of the subscripts, variables and parameters used in the model.

Subscripts

$i = 1,2,...,N$, part type index in the FMS, where *N* is the total number of part type processed in FMS.

$i' = 1,...,B(i)$: index of the i'-th part in batch size of the part type i .

$j = 1,2,...,J(i)$, index for machining operations in the FMC, where $J(i)$ is the total number of operations of part i , $i = 1,2,...,N$.

$k,l,l' = 1,2,...,K$, index for CNC machines, where *K* is the total number of CNC machines in the FMC.

$K_{ii'j} = K(i,i',j)$: set of potential optional CNC machines for processing an operation j of the i'-th part in batch size of part type i , where $j = 1,2,...,J(i); i' = 1,2,...,B(i);\ i = 1,2,...,N$. For instance, $K_{221} = \{1,3\}$ shows that the first operation of the second part of part type 2 can be processed on the CNC machine 1 or machine 3.

Parameters

$B(i)$: Batch size of part i , $i = 1,2,...,N$.

H: length of the planning horizon (*H* = 8 hours).

T_k : the number of tool slots available on machine k , $k = 1,2,...,K$.

$p_{ii'jk}$: processing time of operation j of the i'-th part in batch size of part type i on machine k , where $j = 1,2,...,J(i); i' = 1,2,...,B(i);\ i = 1,2,...,N$.

$ts_{ii'jk}$: number of tool slots required for processing operation *j* of the i'-th part of part type i on machine k, where $j = 1,2,...,J(i); i' = 1,2,...,B(i);\ i = 1,2,...,N$;

$t_{ii'kl}$: Transportation/traveling time from machine k to machine l for the i'-th part of part type *i*, $i = 1,2,...,N; i' = 1,2,...,B(i);\ k,l = 1,2,...,K$.

$LT_{ii'k}$: Loading time of the i'-th part of part type *i* from the loading station to machine *k*.

$ULT_{ii'l'}$: Unloading time of the i'-th part of part type *i* from machine l' to unloading station.

Decision Variables

$$x_{ii'jk} = \begin{cases} 1, \text{if operation } j \text{ of } i'^{-th} \text{part of} \\ \quad \text{part type } i \text{ is assigned to machine } k \\ 0, \text{otherwise} \end{cases}$$

$$x_{ii'} = \begin{cases} 1, \text{ if } i'\text{-}th \text{ part of part type} \\ \quad i \text{ is selected for processing} \\ 0, \text{ otherwise} \end{cases}$$

$$x_{ii'k} = \begin{cases} 1, \quad \text{if } i'\text{-}th \text{ part of part type } i \text{ is loaded and} \\ \quad \text{assigned to machine } k \text{ from loading station} \\ 0, \quad \text{otherwise} \end{cases}$$

$$x_{ii'l'} = \begin{cases} 1, \quad \text{if } i'\text{-}th \text{ part of part type } i \text{ is unloaded and} \\ \quad \text{returned to unloading station from machine } l' \\ 0, \quad \text{otherwise} \end{cases}$$

$$x_{ii'jk} \times x_{ii'(j+1)l} = \begin{cases} 1, \quad \text{if operation } j \text{ of part } (i,i') \\ \text{completed on machine k} \\ \quad \text{is conveyed to machine } l \text{ to} \\ \text{continue operation } (j+1) \\ 0, \text{otherwise} \end{cases}$$

Three objectives are considered to model of FMS production planning such as the system unbalance, makespan and the total flow time (TFT). A mixed integer linear programming (MILP) model is presented for determining the suitable solution of production plan of *N* part types over a limited pool of *K* CNC machines in the FMS. Due to the limitation of the operating time in machines, so the machines are considered in the status of under-utilized (unused capacity of the machine) or over-utilized (the overload of the machine). Most of researchers usually neglect the transporting time (**Abazari et al., 2012; Arıkan & Erol, 2012; V. M. Kumar et al., 2012; Prakash, Khilwani, et al., 2008; M. Tiwari et al., 2007**). Moreover, they have not considered the allocation of each part in each batch size and so the all parts of part types have been assigned to the same machines. Therefore, in this research, the traveling time is used based on the conveyor system to contribute to the makespan and total flow time, and each part of the part type is considered to allocate to different machine in order to ensure the system balanced.

-Minimization of the system unbalance: The balance of workload of machines is balancing the operating time on each machine in the system. It is extended to consider the different allocation for each part of part type to the different or same machines, adapted from (**Abazari et al. 2012; Basnet, 2012**):

$$Min\ SU = \sum_{k=1}^{K} \left| H - \sum_{i=1}^{N} \sum_{i'=1}^{B(i)} \sum_{j=1}^{J(i)} x_{ii'jk} \times p_{ii'jk} \right| \quad (1)$$

-Minimization of makespan: Makespan is the total time to complete processing all the part types.

$$Max\ C(i,i') = \max_{(i,i')} \left[\sum_{k=1}^{K} x_{ii'k} \times LT_{ii'k} + \sum_{j=1}^{J(i)} \sum_{k=1}^{K} x_{ii'jk} \times p_{ii'jk} + \right.$$
$$\left. + \sum_{k=1}^{K} \sum_{l=1}^{K} t_{ii'kl} \times x_{ii'jk} \times x_{ii'(j+1)l} + \sum_{l=1}^{K} x_{ii'l'} \times ULT_{ii'l'} \right] \quad (2)$$

In particular,

$x_{ii'k} \times LT_{ii'k}$: The loading time of part (*i', i*) from loading station to machine *k*

$\sum_{j=1}^{J(i)} \sum_{k=1}^{K} x_{ii'jk} \times p_{ii'jk}$: The process time of part (*i',i*) on machine *k*.

$\sum_{k=1}^{K} \sum_{l=1}^{K} t_{ii'kl} \times x_{ii'jk} \times x_{ii'(j+1)l}$: The traveling time of part (*i', i*) from machine *k* to machine *l* for processing the next operation (*j+1*).

$\sum_{l=1}^{K} x_{ii'l'} \times ULT_{ii'l'}$: The unloading time of part (*i', i*) from machine *l* to unloading station.

-Minimization of the total flow time: The total flow time comprises the total processing time and the transportation/traveling time between machines for processing the parts in the system.

$$Min\ TFT = \sum_{i=1}^{N} \sum_{i'=1}^{B(i)} \sum_{k=1}^{K} x_{ii'k} \times LT_{ii'k} + \sum_{i=1}^{N} \sum_{i'=1}^{B(i)} \sum_{j=1}^{J(i)} \sum_{k=1}^{K} x_{ii'jk} \times p_{ii'jk} +$$
$$+ \sum_{i=1}^{N} \sum_{i'=1}^{B(i)} \sum_{j=1}^{J(i)} \sum_{k=1}^{K} \sum_{l=1}^{K} t_{ii'kl} \times x_{ii'jk} \times x_{ii'(j+1)l} + \sum_{i=1}^{N} \sum_{i'=1}^{B(i)} \sum_{l'=1}^{K} x_{ii'l'} \times ULT_{ii'l'} \quad (3)$$

Constraints

The decision variables are binary (0-1 integers):

$$x_{ii'jk} = \begin{cases} 0 \\ 1 \end{cases} \quad \text{and} \quad x_{ii'} = \begin{cases} 0 \\ 1 \end{cases} \quad (4)$$

The magazines of CNC machines must include enough tool slots for operation's assignment:

$$\sum_{i=1}^{N}\sum_{i'=1}^{B(i)}\sum_{j=1}^{J(i)} x_{ii'jk} \times ts_{ii'jk} \leq T_k \quad (5)$$

Once a part type is chosen, each operation of part type can be processed just by one machine. If a part type is not chosen, no CNC machine in FMS is used to produce any operation.

$$\sum_{k \in K(i,i',j)} x_{ii'jk} = x_{ii'} \quad (6)$$

Research Method

Biogeography is a field that explores the geographical distribution of biological organisms. In the 1960s, the distribution of organisms was discovered and modeled based on the mathematical equations that describe the migration of species from one island to another in the nature. The migration of species shows in existence that in living environment, that is how new species survive and develop. An island is called a habitat when it is insulated geographically to other islands. The geographical areas suitable for the residences of the biological species are described to have high HSI (habitat suitability index). The features in determining the HSI comprise the diversity of vegetation and topographic features, rainfall, temperature and land region. The decision variables that specialize the habitability are called SIVs (suitability index variables), which can be independent variables of the habitats, while HSI can be the dependent variable. The habitats which have a higher HSI will have a larger number of species, whereas the ones lower HSI has a smaller number of species. The high-HSI habitats include many species emigrating to the neighboring habitats. The rate of species immigration in the high-HSI habitats is low due to saturation of species. Thus, in the high-HSI habitats, the rate of emigration is high to create a better condition for species emigrating to the nearby habitats. The rate of immigration is high in the low-HSI habitats due to the sparseness of the species in the populations. Since the suitability of a habitat is directly the diversity of biology, the HSI is higher when the habitat has new species immigrants. Meanwhile the low-HSI habitats which have a low number of species that can go extinct, will open many opportunities for additional immigrations. Due to this, low-HSI habitats are more dynamic and flexible in the species distribution than the high-HSI habitats. A good solution is similar to a high-HSI island, and poor solution can be represented by a low-HSI island. The high-HSI solutions oppose the change more than the low-HSI solutions and share their

features. So, the poor solutions can admit many new features from better solutions. The replacement of new features to the low-HSI solution will make the quality of these solutions higher (**Simon, 2008, 2013**).

BBO is a nature inspired algorithm and a novel approach to solve NP-hard problems, similar to the genetic algorithms (**Rahmati & Zandieh, 2012**). In the BBO, the fitness function is only utilized in determining the migration rates (**Paslar et al., 2015**). In recent years, BBO had emerged to bring potential applications in the manufacturing systems. It has been used to handle the scheduling problem of flexible manufacturing system (**Berghida & Boukra, 2015; Paslar et al., 2015; Rahmati & Zandieh, 2012; Xiaohua Wang & Duan, 2014**). The proposed approach for production planning in FMS is described in Figure 2 with the steps as follows.

Step 1: Initial population: Initialize feasible solution.

Step 2: Duplicates: to check and estimate the individual duplications in population.

Step 3: Evaluate the objective function with the constraints.

Step 4: Operators: migration and mutation operators.

Step 5: Sort: ranks of individuals in a population based on non-dominated sorting and crowding distance.

The size of new population is increased twice and it will undergo selective mechanism based on non-dominated sorting and crowding distance conducted by Deb, Pratap, Agarwal, and Meyarivan (**2002**) to form an entirely new population with original size. This new population will continue to cycle until the solutions satisfy the requirements or terminated conditions obtained. Figure 2 presents the steps of BBO. We firstly create the initial population consists of feasible solutions. Then, the operators of migration and mutation are applied in populations to create a new population that consists of improved individuals. To take advantage of the best individuals in the new and old populations, a combined population is created and includes all the individuals. Therefore, the size of new population is increased twofold, and it will undergo selective mechanism based on non-dominated sorting and crowding distance to form an entirely new population with original size. This new population will continue the cycle until the solutions satisfy the requirements or terminated conditions obtained.

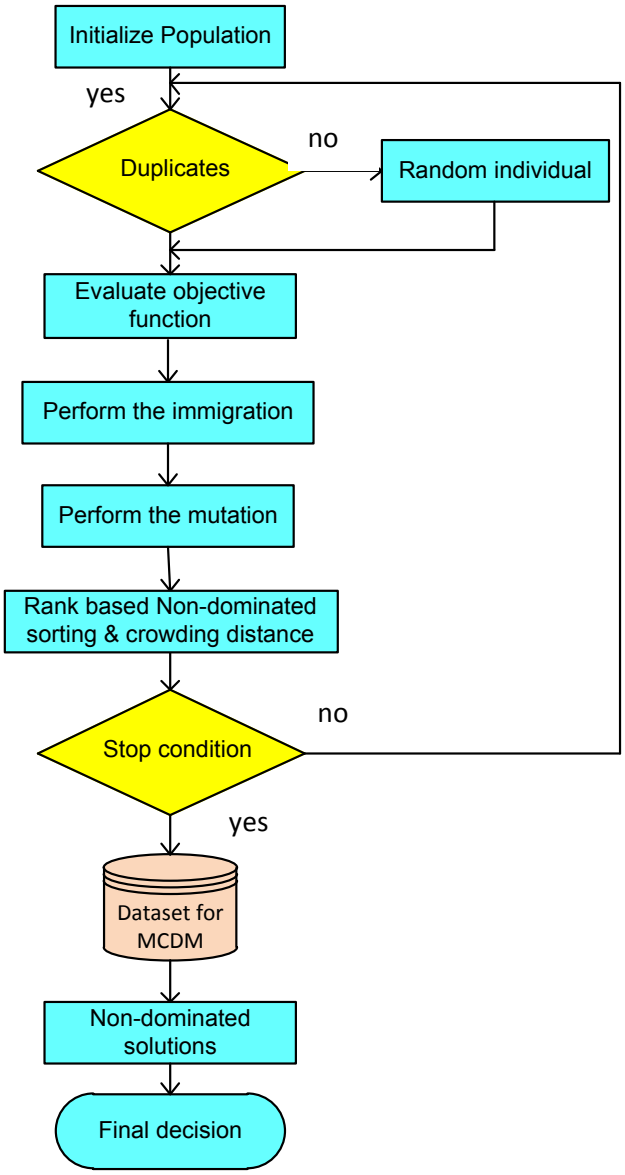

Figure 2. The proposed approach for production planning in FMC

For starting the algorithm, an initial population of solutions is generated. These solutions are presented by the structure of habitats. The approach is used to create the initial population based on the methods presented by Rahmati and Zandieh (**2012**), Paslar (**et al. 2015**) and Xiaojuan Wang, Gao, Zhang, and Shao (**2010**). In their method, the two machines are chosen from the set of potential machines for each operation. For the aim of machines selection, a random number is generated within the interval [0, 1], if this random number is less than 0.8, a machine with a shorter processing time is prior to select; otherwise, a machine with longer processing time is selected.

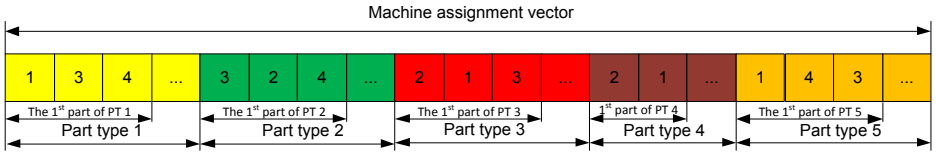

Figure 3. The presentation of habitat, adapted from (**Xiaojuan Wang et al., 2010; Rahmati & Zandieh, 2012; and Paslar et al., 2015**)

The presentation of the structure of the habitat is similar to the structure of the individuals in genetic algorithms. The structure of the habitat in this approach is shown as in Figure 3. This representation consists of vector o assigning the suitable operations to the potential machines in the system. It means that the suitable machines are assigned to the corresponding operations of the first part of part types 1, 2, 3, 4, and 5 needed to be processed in the system. From the machine assignment vector, we can read the suitable solution as [Part type 1: (O_{11}, M1); (O_{12}, M3); (O_{13}, M4)…; Part type 2: (O_{21}, M3); (O_{22}, M2); (O_{23}, M4)…; Part type 3: (O_{31}, M2); (O_{32}, M1); (O_{33}, M3)…; Part type 4: (O_{41}, M2); (O_{42}, M1)…; and Part type 5: (O_{51}, M1); (O_{52}, M4); (O_{53}, M3)…].

Migration Operator

After choosing the immigrating and emigrating habitats, the operators of migration are completed based on the principles of the crossover operator in GA. Multi-point preservative crossover (MPX) used for the process of migrating the representation of the habitat. MPX are applied for the migration operators in the vectors of machine assignment as in Figure 4 (**Rahmati & Zandieh, 2012**). The principles of MPX are implemented as follows Paslar (**et al., 2015**).

Step 1: For the operator of MPX migration on machine assignment vector, we randomly generate a vector comprising of values 0 and 1. This vector has the same length with habitat size. The name of vector called Rand.

Step 2: Direct copies (same positions) of IH to the MH at Rand = 0.

Step 3: Direct copies (same positions) of EH to the MH at Rand = 1.

Mutation Operator

It is used to maintain and increase diversity of solutions by modifying one or more chosen SIV randomly. The principle of mutation operator is illustrated in Figure 5.

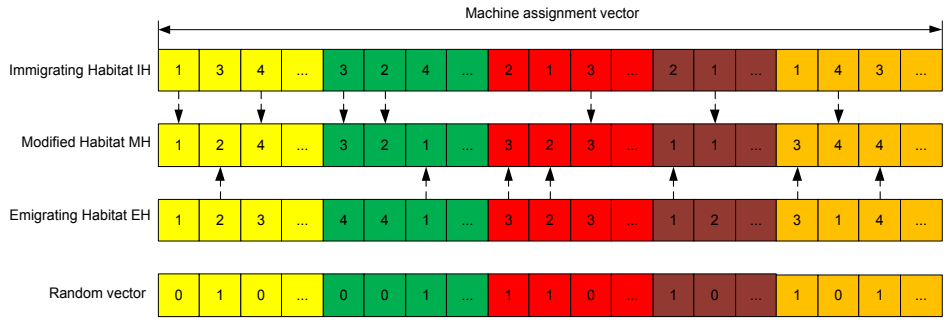

Figure 4. Migration operator of MPX

Step 1: Choose the machine assignment vector of the habitat SIV.

Step 2: Randomly select two positions, and change each number with another machine from a set of alternatives for these two operations.

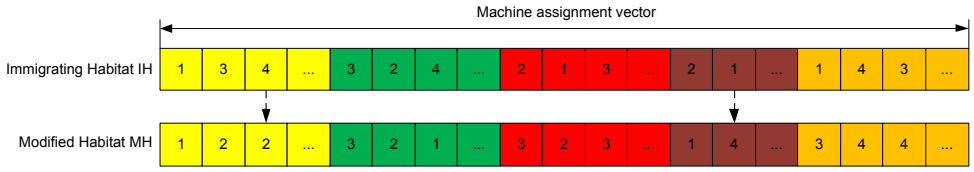

Figure 5. Mutation operator of vectors of machine assignment

Case Study

The FMS consists of four dummy machines, robot for loading/unloading and conveyor system with one shortcut conveyor to transfer the part type. Finding a realistic production plan is extremely difficult because it involves confidential business technology. The factors of processing time and traveling time are not easily accessible. Production companies usually will not stop the production line to give way to test and study because of the economics and competitiveness. Therefore, the real process plan for FMS was adapted from Mukhopadhyay, Midha, and Krishna (**1992**) and a new data of transportation time is added to build a model of FMC in the practice at the manufacturing SMEs. The traveling time is designed based on the length and speed of conveyor system. The database of traveling time between machines and loading/unloading stations is shown as in Table 1.

To examine the applicability of the proposed NSBBO approach, we developed a computational program based on MATLAB software and run on Intel® core™ i5-2410M 2.3GHz, 4GB DDR3 memory with Window 7. The parameters of BBO method are set in this study after checking a number of experimentations:

The habitat size (it means population size): 50; Maximum migration and immigration rate of each habitat: $E = I = 1$; Mutation probability m_{max}: 0.01 and Terminal criteria: the number of iterations is 1000.

	M1	M2	M3	M4
L/UL	2	4	8	10
CNC machine 1	-	2	6	8
CNC machine 2	10	-	4	6
CNC machine 3	6	8	-	3
CNC machine 4	4	4	10	-

Table 1. Traveling time between machines in FMS (min).

The number of part type is increased, so the complexity of the problem will be increased. The FMS is considered with four CNC machines to produce the number of part types with different batch sizes. For instance, the process plan consists of 8 part types in Table 2. The batch size for each part type is 8, 9, 13, 16, 9, 10, 12 and 13, respectively. The number of optional operation is large, so the production process becomes more flexible. It means that the opportunity for combining the machines and operations is considerable. Table 2 shows the best solution for selecting the most appropriate combination of machines and operations in FMS. Figure 6 shows all the non-dominated sorting solutions from a run of NSBBO until all the batch sizes are completed with the process. Figure 7 presents the relationship between makespan and total flow time as a Pareto front.

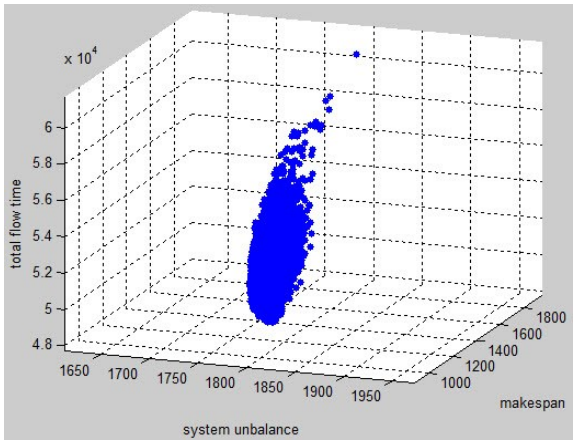

Figure 6. The non-dominated sorting solutions from a run of NSBBO with three objectives

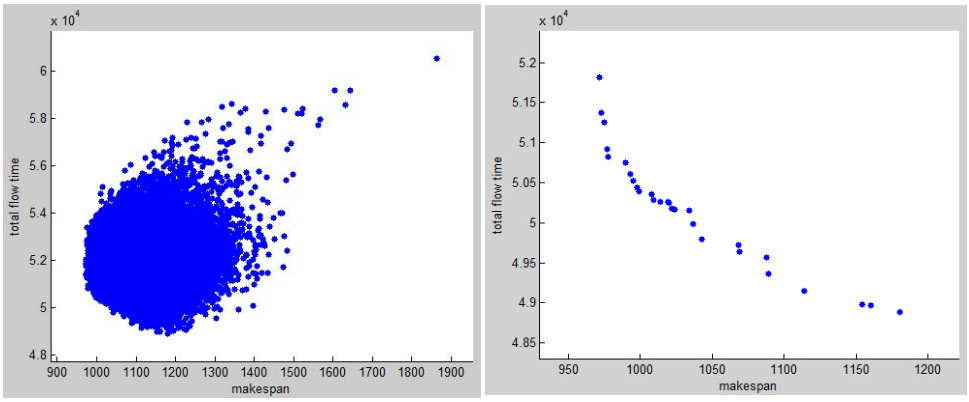

Figure 7. Relationship between makespan and total flow time.
(a) all the non-dominated sorting solutions
(b) potential non-dominated sorting solutions

Part type	Batch size	Part Type in batch	O1	O2	O3
1	8	1,2,…,8	3	0	0
2	9	1, 3, 4, 5, 7, 9	4	4	2
		2, 6, 8	1	4	2
3	13	1,2,3,4,5,6,7	1	3	0
		8	4	3	0
		9, 10, 11, 12, 13	1	3	0
4	6	1, 2, 3, 4, 5, 6	3	4	0
5	9	1	2	2	0
		2, 3, 4, 5, 6, 7, 8, 9	3	2	0
6	10	1, 2, 3, 4, 6, 7, 8, 9	4	2	2
		5, 10	4	3	2
7	12	1, 3, 4, 5, 6, 8, 11, 12	3	3	4
		2, 7, 9, 10	3	2	4
8	13	1, 2, 6, 7, 8, 9, 10, 11, 12, 13	1	2	1
		3, 4	2	2	1
		5	2	1	1
System Unbalance: 1793; Makespan: 978; Total Flow Time: 50828					

Table 2. The most suitable combination of machine and operation in FMS for the case study.

The optional operations of part type are assigned to obtain the optimal objectives of system unbalance, makespan and total flow time. For example, the part type 2 is assigned according to sequences of (4 – 4 – 2) and (1 - 4 – 2). In particular, the operations 1, 2 and 3 of first part of part type 2 in batch size are allocated to CNC machines 4, 4 and 2. However, the operations 1, 2 and 3 of the second part of part type 2 in batch size are

assigned to CNC machines 1, 4 and 2. Clearly, these machine assignments are different to obtain the system unbalance of each machine. Similarity, the other operations of other part types can be interpreted. The proposed model of multi-objective production planning in FMS is solved using the non-dominated sorting BBO procedure. We have chosen three objectives of minimizing SU, makespan and total flow time. Minimizing the total flow time will make the workload unbalanced with the larger queues closed to the most heavily used machines. It is important to realize that two of three objectives are dependent with each other and not conflicting together. Thus, a surface of Pareto frontier is difficult to demonstrate in this case. Besides, the results obtained by the proposed NSBBO are compared with those of four algorithms available in the literature (see Table 3).

No	Part	B&B	Prakash, Khilwani, et al. (2008)	Nagarjuna et al. (2006)	Mukhopadhyay et al. (1992)	Abazari et al. (2012)	NSBBO
1	8	81	318	122	122	81	1793
2	6	202	**524**	202	202	202	**316**
3	5	72	**312**	130	**286**	72	**156**
4	5	**819**	**819**	**819**	**819**	**819**	**819**
5	6	133	**536**	219	**364**	133	**289**
6	6	178	**518**	**265**	**265**	178	**236**
7	6	147	477	183	147	147	**99**
8	7	111	677	288	459	111	1246
9	7	**309**	333	**309**	315	**309**	**309**
10	6	184	**272**	**271**	**320**	184	**221**

Table 3. Comparison of the results obtained on the system unbalance by different methods.

As seen in the Table 3, the proposed NSBBO for multiple objective production planning for FMS has obtained the globally optimal solutions of all the problems and its performance is considerable potential when compared with other existing methods in the literature. The results of NSBBO were considerably better than those of Prakash (**et al., 2008**) and Mukhopadhyay (**et al., 1992**) and competitive when compared with results of Nagarjuna (**et al., 2006**).

However, the result of NSBBO is acceptable when compared with one of Abazari (**et al., 2012**). Because NSBBO method considers the multiple objective solutions, so the best solution is identified based on the trade-off or balance among the values of objectives (system unbalance, makespan and total flow time) and different from the best solution in single objective problem. Moreover, one more difference between results of NSBBO with other methods is considered of completion of the desired

batch sizes of FMS. As seen in Table 3, the system unbalance of FMS has been reported in the case of completing all the batch size of part types. Prakash (**et al., 2008**) Nagarjuna (**et al., 2006**), **Mukhopadhyay** (**et al., 1992**) and Abazari (**et al., 2012**) have ignored the consideration of the completion of all the batch sizes of part types. Thus, the problem 1 and problem 8 have the very large values of system unbalance. It's easy to notice that makespan in this case is greater than 480 minutes, which describes the time of the first shift in a day. Therefore, it is essential to suggest that FMS had better continue operating the second shifts to complete all the part types with desired batch sizes. This is very convenient to assess the delivery time for the valued customers.

To validate the results of the proposed production planning model of FMS from NSBBO, the simulation of FMS is implemented in FlexSim software to observe the performance and behavior of FMC. Table 4 shows the comparison of system unbalance, makespan and total flow time from NSBBO analytical and simulation experiments. We realized that the result of NSBBO was quite similar to results of FlexSim simulation. It means that FlexSim simulation of FMS is a powerful tool to validate the proposed model, and results of NSBBO are competitive and potential to explore the most appropriate process planning.

	Case study		
Performance index	Simulation	NSBBO	Error
System unbalance	1739.36	1793	3%
Makespan	973.01	978	0.5%
Total flow time	50560.01	50858	0.6%

Table 4. The comparison of system unbalance, makespan and total flow time (min).

In summary, simulation is used to evaluate the designed FMS in terms of productivity to produce the various part types with the corresponding batch sizes from customers' demand. From the results of the comparison between the two models of simulation and analytical non-dominated sorting BBO method, it's easy to realize that the proposed FMS model is able to complete the process planning and achieve batch size as required. Simulation model also shows the status of each CNC machine to improve the machine's utilization and evaluate the total performance of FMS. Due to the complexity of FMS, the adoption of an integrated approach on manufacturing goals to obtain the objectives of minimization of system unbalance, makespan and total flow time is possible. A feasible integrated solution approach NSBBO based on the biogeography based optimization and non-dominated sorting is proposed to generate the most suitable process plans in the context of manufacturing SMEs. The explored results

are verified based on the LINGO software. Thus, it is proved that the proposed NSBBO approach is general enough and applicable to determine the most suitable process plan for production planning decision in FMS.

Conclusion

Globalization of business processes motivates manufacturing SMEs to implement advanced manufacturing technology, especially in the implementation of the manufacturing systems to produce competitive products in the market. In this paper, we presented a multiple objective production planning model to determine the most suitable combination of machines and operations in FMS. The proposed model takes into account numerous real parameters comprising of the capacity of machines, tool magazines, processing time, transportation time, and allows the overloading status of machines. Moreover, this model considered the different allocation of each part of the batch into various machines in FMS. Besides, the consideration of multiple objectives of system unbalance, makespan and total flow time is significant in this model. The NSBBO approach was adapted to generate the most suitable process plans in the context of manufacturing SMEs. The results of NSBBO is compared with other methods in the literature in terms of the system unbalance of 10 problems with different FMS sizes. The results show that the NSBBO method is potential in achieving near-optimal, and in some cases optimal, solutions. Thus, it is proved that the proposed approach of BBO and non-dominated sorting procedure is general enough and can be applied to a variety of manufacturing enterprises for FMS. The simulation results were compared with performance indicators such as system unbalance, makespan and total flow time to confirm the reasonableness of the designed FMS.

As an extension of this research, the proposed model can be considered with additional resources such as jigs/fixtures, material handling systems (robots, AGVs) and the constraints on the availability of resources. The sequencing and scheduling of the selected machines and operations will be suggested for more extension. Moreover, the parameters of processing time of operations and traveling time of machining parts can be addressed in the context of fuzzy numbers and gray numbers where there is existing uncertain information in the manufacturing environment. Besides, fuzzy resources and stochastic machine assignment problems will be considered as a direction for future research. Finally, one future possible area of this research is to develop the multi-agent based machine assignment, sequencing, scheduling, and integration system for exchanging information effectively in real manufacturing cells of SMEs. The continuation of extension for NSBBO to include the variation of migration rates should be taken note and compared with NSGA-II and SPEA-2 in

terms of performance indicators. Moreover, the constraint handling methods also combined with NSBBO to solve the constrained multi-objective machine loading problems are interesting directions for future.

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References

Abazari, A. M., Solimanpur, M., & Sattari, H. (2012), 'Optimum loading of machines in a flexible manufacturing system using a mixed-integer linear mathematical programming model and genetic algorithm', *Computers & Industrial Engineering*, 62(2), 469-478.

Arikan, M., & Erol, S. (2006), 'Meta-heuristic approaches for part selection and tool allocation in flexible manufacturing systems', *International Journal of Computer Integrated Manufacturing*, 19(4), 315-325.

Arıkan, M., & Erol, S. (2012), 'A hybrid simulated annealing-tabu search algorithm for the part selection and machine loading problems in flexible manufacturing systems', *The International Journal of Advanced Manufacturing Technology*, 59(5-8), 669-679.

Atmani, A., & Lashkari, R. (1998), 'A model of machine-tool selection and operation allocation in FMS', *International Journal of Production Research*, 36(5), 1339-1349.

Basnet, C. (2012). A hybrid genetic algorithm for a loading problem in flexible manufacturing systems. *International Journal of Production Research*, 50(3), 707-718.

Berghida, M., & Boukra, A. (2015), 'EBBO: an enhanced biogeography-based optimization algorithm for a vehicle routing problem with heterogeneous fleet, mixed backhauls, and time windows', *The International Journal of Advanced Manufacturing Technology*, 77(9-12), 1711-1725.

Biswas, S., & Mahapatra, S. (2008), 'Modified particle swarm optimization for solving machine-loading problems in flexible manufacturing systems', *The International Journal of Advanced Manufacturing Technology*, 39(9-10), 931-942.

Candan, G., & Yazgan, H. R. (2015), 'Genetic algorithm parameter optimisation using Taguchi method for a flexible manufacturing system scheduling problem', *International Journal of Production Research*, 53(3), 897-915.

Chan, F. T., & Swarnkar, R. (2006), 'Ant colony optimization approach to a fuzzy goal programming model for a machine tool selection and operation allocation problem in an FMS', *Robotics and Computer-Integrated Manufacturing*, 22(4), 353-362.

Chan, F., Swarnkar, R., & Tiwari, M. (2005), 'Fuzzy goal-programming model with an artificial immune system (AIS) approach for a machine tool selection and operation allocation problem in a flexible manufacturing system', *International Journal of Production Research*, 43(19), 4147-4163.

Chen, J.-H., & Ho, S.-Y. (2005), 'A novel approach to production planning of flexible manufacturing systems using an efficient multi-objective genetic algorithm', *International Journal of Machine Tools and Manufacture*, 45(7-8), 949-957.

Das, K., Baki, M., & Li, X. (2009), 'Optimization of operation and changeover time for production planning and scheduling in a flexible manufacturing system', *Computers & Industrial Engineering*, 56(1), 283-293.

Deb, K., Pratap, A., Agarwal, S., & Meyarivan, T. (2002), 'A fast and elitist multiobjective genetic algorithm: NSGA-II', *IEEE Transactions on Evolutionary Computation*, 6(2), 182-197.

Gamila, M. A., & Motavalli, S. (2003). A modeling technique for loading and scheduling problems in FMS. *Robotics and Computer-Integrated Manufacturing*, 19(1-2), 45-54.

Goswami, M., & Tiwari, M. (2006), 'A reallocation-based heuristic to solve a machine loading problem with material handling constraint in a flexible manufacturing system' *International Journal of Production Research*, 44(3), 569-588.

Goswami, M., Tiwari, M., & Mukhopadhyay, S. (2008), 'An integrated approach to solve tool-part grouping, job allocation and scheduling problems in a flexible manufacturing system', *The International Journal of Advanced Manufacturing Technology*, 35(11-12), 1145-1155.

Groover, M. P. (2016), *Automation, Production Systems, and Computer-Integrated Manufacturing*, India: Pearson Education India.

Guldogan, E. U. (2011), 'An integrated approach to machine selection and operation allocation problem', *The International Journal of Advanced Manufacturing Technology*, 55(5-8), 797-805.

Jahromi, M., & Tavakkoli-Moghaddam, R. (2012), 'A novel 0-1 linear integer programming model for dynamic machine-tool selection and operation allocation in a flexible manufacturing system', *Journal of Manufacturing Systems*, 31(2), 224-231.

Koşucuoğlu, D., & Bilge, Ü. (2012), 'Material handling considerations in the FMS loading problem with full routing flexibility', *International Journal of Production Research*, 50(22), 6530-6552.

Kumar, A., Tiwari, M., Shankar, R., & Baveja, A. (2006), 'Solving machine-loading problem of a flexible manufacturing system with constraint-based genetic algorithm', *European Journal of Operational Research*, 175(2), 1043-1069.

Kumar, N., & Shanker, K. (2000), 'A genetic algorithm for FMS part type selection and machine loading', *International Journal of Production Research*, 38(16), 3861-3887.

Kumar, R. R., Singh, A. K., & Tiwari, M. (2004), 'A fuzzy based algorithm to solve the machine-loading problems of a FMS and its neuro fuzzy Petri net model', *The International Journal of Advanced Manufacturing Technology*, 23(5-6), 318-341.

Kumar, V. M., Murthy, A., & Chandrashekara, K. (2012), 'A hybrid algorithm optimization approach for machine loading problem in flexible manufacturing system', *Journal of Industrial Engineering International*, 8(1), 3.

Mahmudy, W. F., Marian, R., & Luong, L. H. S. (2013), 'Modeling and optimization of part type selection and loading problem in flexible manufacturing system using real coded genetic algorithms', *International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering*, 7(4), 251-260.

Mandal, S. K., Pandey, M. K., & Tiwari, M. (2010), 'Incorporating dynamism in traditional machine loading problem: an AI-based optimisation approach', *International Journal of Production Research*, 48(12), 3535-3559.

Mishra, S., Prakash, Tiwari, M., & Lashkari, R. (2006), 'A fuzzy goal-programming model of machine-tool selection and operation allocation problem in FMS: a quick converging simulated annealing-based approach', *International Journal of Production Research*, 44(1), 43-76.

Mukhopadhyay, S., Midha, S., & Krishna, V. M. (1992), 'A heuristic procedure for loading problems in flexible manufacturing systems', *The International Journal of Production Research*, 30(9), 2213-2228.

Mukhopadhyay, S., Singh, M., & Srivastava, R. (1998), 'FMS machine loading: a simulated annealing approach', *International Journal of Production Research*, 36(6), 1529-1547.

Nagarjuna, N., Mahesh, O., & Rajagopal, K. (2006), 'A heuristic based on multi-stage programming approach for machine-loading problem in a flexible manufacturing system', *Robotics and Computer-Integrated Manufacturing*, 22(4), 342-352.

Paslar, S., Ariffin, M., Tamjidy, M., & Hong, T. S. (2015), 'Biogeography-based optimisation for flexible manufacturing system scheduling problem', *International Journal of Production Research*, 53(9), 2690-2706.

Prakash, A., Khilwani, N., Tiwari, M., & Cohen, Y. (2008), 'Modified immune algorithm for job selection and operation allocation problem in flexible manufacturing systems', *Advances in Engineering Software*, 39(3), 219-232.

Prakash, A., Shankar, R., Shukla, N., & Tiwari, M. K. (eds.) (2007), 'Solving Machine Loading Problem of FMS: An Artificial Intelligence (AI) Based Random Search Optimization Approach', *Handbook of Computational Intelligence in Manufacturing and Production Management*, USA: Idea Group Reference; 1 edition, pp.19-43.

Prakash, A., Tiwari, M. K., & Shankar, R. (2008), 'Optimal job sequence determination and operation machine allocation in flexible manufacturing systems: an approach using adaptive hierarchical ant colony algorithm', *Journal of Intelligent Manufacturing*, 19(2), 161-173.

Rahmati, S. H. A., & Zandieh, M. (2012), 'A new biogeography-based optimization (BBO) algorithm for the flexible job shop scheduling problem', *The International Journal of Advanced Manufacturing Technology*, 58(9-12), 1115-1129.

Rai, R., Kameshwaran, S., & Tiwari, M. (2002), 'Machine-tool selection and operation allocation in FMS: solving a fuzzy goal-programming model using a genetic algorithm', *International Journal of Production Research*, 40(3), 641-665.

Sarma, U., Kant, S., Rai, R., & Tiwari, M. (2002), 'Modelling the machine loading problem of FMSs and its solution using a tabu-search-based heuristic', *International Journal of Computer Integrated Manufacturing*, 15(4), 285-295.

Shin, K. S., Park, J.-O., & Kim, Y. K. (2011), 'Multi-objective FMS process planning with various flexibilities using a symbiotic evolutionary algorithm', *Computers & Operations Research*, 38(3), 702-712.

Simon, D. (2008), 'Biogeography-based optimization', *IEEE Transactions on Evolutionary Computation*, 12(6), 702-713.

Simon, D. (2013), *Evolutionary optimization algorithms*, USA: John Wiley & Sons.

Soolaki, M., & Zarrinpoor, N. (2014), 'A new 0-1 linear programming approach and genetic algorithm for solving assignment problem in flexible manufacturing system', *The International Journal of Advanced Manufacturing Technology*, 75(1-4), 385-394.

Stecke, K. E., & Solberg, J. J. (1981), 'Loading and control policies for a flexible manufacturing system', *The International Journal of Production Research*, 19(5), 481-490.

Sujono, S., & Lashkari, R. (2007), 'A multi-objective model of operation allocation and material handling system selection in FMS design', *International Journal of Production Economics*, 105(1), 116-133.

Swarnkar, R., & Tiwari, M. (2004), 'Modeling machine loading problem of FMSs and its solution methodology using a hybrid tabu search and simulated annealing-based heuristic approach', *Robotics and Computer-Integrated Manufacturing*, 20(3), 199-209.

Tiwari, M., Rika, B. H., Rthi, N. V., Jaggi, P., & Mukhopadhyay, S. (1997), 'A heuristic solution approach to the machine loading problem of an FMS and its Petri net model', *International Journal of Production Research*, 35(8), 2269-2284.

Tiwari, M., Saha, J., & Mukhopadhyay, S. (2007), 'Heuristic solution approaches for combined-job sequencing and machine loading problem in flexible manufacturing systems', *The International Journal of Advanced Manufacturing Technology*, 31(7-8), 716-730.

Tiwari, M. K., Kumar, S., & Shankar, R. (2006), 'Solving part-type selection and operation allocation problems in an FMS: An approach using constraints-based fast simulated annealing algorithm', *IEEE Transactions on Systems, Man, and Cybernetics-Part A: Systems and Humans*, 36(6), 1170-1184.

Udhayakumar, P., & Kumanan, S. (2010), 'Sequencing and scheduling of job and tool in a flexible manufacturing system using ant colony optimization algorithm', *The International Journal of Advanced Manufacturing Technology*, 50(9-12), 1075-1084.

Vidyarthi, N., & Tiwari, M. (2001), 'Machine loading problem of FMS: a fuzzy-based heuristic approach', *International Journal of Production Research*, 39(5), 953-979.

Wang, X., & Duan, H. (2014), 'A hybrid biogeography-based optimization algorithm for job shop scheduling problem', *Computers & Industrial Engineering*, 73, 96-114.

Wang, X., Gao, L., Zhang, C., & Shao, X. (2010), 'A multi-objective genetic algorithm based on immune and entropy principle for flexible job-shop scheduling problem', *The International Journal of Advanced Manufacturing Technology*, 51(5-8), 757-767.

Yang, H., & Wu, Z. (2002), 'GA-based integrated approach to FMS part type selection and machine-loading problem', *International Journal of Production Research*, 40(16), 4093-4110.

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Electric Motor and Dry Clutch Control in Launch Manoeuvres of Mild-Hybrid Vehicles Based on AMT/DCT Transmissions

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Abstract

Mild-Hybrid Electric Vehicles (mild-HEVs) earned market share over the last years an as effective roadmap to limit air pollution in big cities. In addition to this role, hybrid propulsion can be used to avoid dry clutch overheating in mild-HEVs equipped with automated manual transmissions. Indeed, high thermal level could result in serious damaging of dry clutch linings with very fast decay of expected lifespan affecting vehicle reliability. This paper shows results of vehicle launch simulations to highlight how the propulsion due to electric motor can effectively reduce clutch thermal stress during the slipping phase.

Keywords: Hybrid electric vehicle; dry clutch; engagement control

Introduction

In the last decades, Hybrid Electric Vehicles (HEVs) and Electric Vehicles (EVs) are gaining significant share of the automobile market. Their success is mainly due to higher fuel efficiency than conventional vehicles which results also in a reduction of pollutant emissions.

By analysing the driveline structure, in parallel HEVs both the internal combustion engine (ICE) and electric motor (EM) can propel, separately or at the same time, the vehicle wheels. Series HEVs differ from parallel HEVs in the role of ICE as energy from combustion engine is converted into electric energy to charge the battery pack or to propel the wheels (**Chan, 2007; Oh et al., 2007; Pisu & Rizzoni, 2007**).

The importance of moving toward sustainable mobility is strongly linked to the need to reduce air pollution and the greenhouse effect, especially in big cities. To this aim, many studies have been proposed to improve the efficiency of hybrid vehicles.

In (**Wang et al., 2015**), dynamic programming global optimization algorithm is applied in HEV to search optimal solution in an assigned speed cycle that minimize the fuel consumption keeping the balance of battery state of charge (SOC). Moreover, in (**Tribioli et al., 2014**) a real-time energy management strategy for plugin HEVs based on optimal control theory is proposed.

In (**Ye et al., 2013**), a comprehensive control scheme, including energy management and coordinated control of parallel hybrid electric bus with automated manual transmission (AMT) based on dry clutch is presented. Instead, in (**Vagg et al., 2016**) a stochastic dynamic programming (SDP) is applied to optimal control of HEV.

The electric motor (EM) can even play a crucial role to reduce the thermal stress in dry clutch automated manual transmission (AMT) and dual clutch transmission (DCT) during the slipping phase by avoiding critical values (**Pisaturo & Senatore, 2017; Pisaturo, Senatore & D'Agostino, 2017**). Indeed, the most important problem with dry clutch systems like AMT and DCT is the overheating due to repeated shifting (**Pica et al., 2016; Pisaturo & Senatore, 2016**) that results in poor quality engagements or even permanent damage of clutch frictional materials or facings. Thus, the accuracy of clutch temperature estimation deeply affects the control unit decisions. This paper is an extended version of (**Pisaturo & Senatore, 2017**) but conversely from it, in this paper a more complex thermal model has been implemented in the transmission control unit (TCU) to activate the EM and reduce thermal stress on clutch components. Indeed, the advantage to have a complex thermal model is to better predict the transmitted clutch torque and consequently the improvement of the passenger comfort together to the extension of clutch life. Furthermore, the actuators' delay have been considered in the Model Predictive Control (MPC) design in the choice of both control and prediction to improve control performances. Particularly, critical launch manoeuvres with high initial clutch material temperature are taken into account. The results highlight how the activation of EM reduces the thermal power generated during the engagement manoeuvre by inhibiting clutch damage.

Parallel HEV Driveline

Driveline model

This section describes the driveline model used for simulating the parallel HEV longitudinal dynamics, where T indicates the torques, J the inertias and b the damping coefficients. Moreover, the subscripts e, f, c, g, d, m, w indicate engine, flywheel, clutch disc, gearbox, differential, electric motor and wheels, respectively. The scheme of the analysed driveline under the

hypothesis of rigidity of all the shafts is reported in Figure 1 and the related equations are:

$$J_{ef}\dot{\omega}_{e} = T_{e} - b_{e}\omega_{e} - T_{fc} \tag{1}$$

$$J_{v}\dot{\omega}_{w} = T_{w} + sr_{2}r_{d}T_{m} - \left(b_{g}\left(r_{1}r_{d}\right)^{2} + sb_{m}\left(r_{2}r_{d}\right)^{2}\right)\omega_{w} - T_{w} \tag{2}$$

where r_1, r_2 and r_d, are the gear ratios on the engine side, electric motor side and differential respectively. Moreover, s is a parameter used to switch between the HEV mode (s = 1) and pure ICE mode (s = 0). In addition, the following positions hold:

$$\begin{aligned} J_{ef} &= J_{e} + J_{f} \\ J_{v} &= J_{w} + J_{d} + \left(J_{g2}\right)r_{d}^{2} + \left(J_{g1} + J_{c}\right)\left(r_{1}r_{d}\right)^{2} + \left(J_{g3} + sJ_{m}\right)\left(r_{2}r_{d}\right)^{2} \\ T_{w} &= mgR_{w}\left(\sin(\phi) + f\cos(\phi)\right) + \frac{1}{2}\rho AC_{x}v^{2}R_{w} + T_{brake} \end{aligned} \tag{3}$$

where, m is the vehicle mass, R_w is the wheel radius, ϕ is the road slope, f is the rolling resistance coefficient, aria ρ is the air density, A is the vehicle frontal area, C_x is the air drag coefficient, v the vehicle speed and T_{brake} is the braking torque.

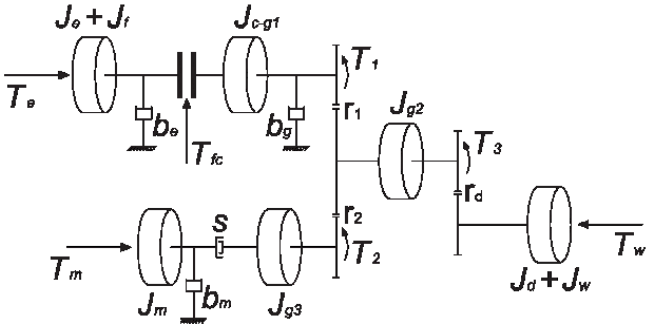

Figure 1 Driveline model.

The equation related to the "locked-up" model can be easily achieved from eqs. (1) and (2) by taking into account driveline dynamics reduced to engine (or wheel) shaft.

Internal combustion engine model

The engine behaviour has been implemented through a static torque map as function of engine speed ("plant" output) and accelerator pedal as well. Particularly, the first MPC output given by the reference engine torque is used to achieve the accelerator pedal signal by way of engine map inversion. Moreover, the delay introduced by the so-called engine torque build-up is modelled in all the performed simulations. Such an effect is related to the transient response turbocharger in modern automotive and truck diesel engines to attain steady-state conditions since optimization as

design key-factor is based on low specific consumption in stationary states (**Rakopoulos & Giakoumis, 2009**).

Models for Dry Clutch and Electric Motor

Dry clutch model

In (**Vasca et al., 2011**), a model of frictional torque in dry clutch based AMT gearbox is proposed. The paper underlines the role of the cushion spring load-deflection characteristic as well as its influence on clutch torque transmission. The model is depicted by neglecting the thermal effects. Instead, in (**D'Agostino, Senatore & Pisaturo, 2013**) the Authors proposed a more complex transmissibility model which covers thermal effects both on cushion spring and clutch frictional response:

$$T_{fc}(x_{to},\theta_{fs},\theta_{cm},v_s,p) = n\mu(v_s,p,\theta_{cm})R_m F_{fc}(\delta_f(x_{pp}(x_{to},\theta_{fs}),\theta_{fs})) \quad (4)$$

where T_{fc} is the transmitted clutch torque, x_{to} is the throwout bearing position, θ_{fs} and θ_{cm} are the cushion spring and clutch material temperature respectively. $v_s = R_m\,\omega_{sl}$ is the linear sliding speed, R_m is the mean radius, $\omega_{sl} = |\omega_e - \omega_c|$ is the difference between the engine and clutch angular speeds, p is the contact pressure, n is the number of friction surfaces, μ is the friction coefficient, F_{fc} is the clamping force, δ_f is the cushion spring deflection and x_{pp} is the pressure plate position.

The clutch torque model is coupled to the temperature rise equation through the cushion spring load-deflection characteristic and frictional material response as well. The clutch actuator dynamics is given by discrete-time model with unitary gain first-order transfer and 0.1 s time constant. Thus, the reference clutch torque, i.e. the second output of the controller is inverted by a simplified clutch model to provide as output the reference throwout bearing position ("position controlled clutch"). The latter signal as input of the clutch actuator allows the calculation of the actual clutch torque in a detailed clutch torque map (n-D look-up table).

By considering the clutch transmissibility model described in equation (4), it is clear that an estimation of both clutch facing and cushion spring temperature is necessary. For this reason, a lumped thermal model has been implemented to take the temperature rise into account during the slipping phase. The model is inspired to the thermal model proposed in (**Pica et al., 2016**) whereas in the present paper the cushion spring response to the temperature change is modelled in addition to frictional material response. The main hypothesis is that the whole mechanical work is converted into heat by friction phenomena and that it is equally distributed onto the frictional surfaces. Moreover, when clutch is open, i.e. $\beta = 0$, only convective losses take place whereas when clutch is in the slipping phase, i.e. $\beta = 1$, only conductive phenomena occur and

convective losses are negligible on cushion spring and clutch material. On the contrary, the body convective losses cannot be neglected when the clutch is closed. For this reason, the term (2 - β) accounts for about doubled clutch surface active to convective heat exchange when clutch is open. Thus, the thermal dynamics of clutch material θ_{cm}, body θ_b and cushion spring θ_{fs} is provided by first order differential equations:

$$\begin{aligned}
\dot{\theta}_b &= \alpha_1(\theta_{cm}-\theta_b)-\alpha_2(2-\beta)(\theta_b-\theta_h)+\alpha_3\frac{T_{fc}\omega_{sl}}{2}\\
\dot{\theta}_{cm} &= \alpha_4\beta(\theta_{cm}-\theta_b)-\alpha_5(1-\beta)(\theta_{cm}-\theta_h)-\alpha_6\beta(\theta_{cm}-\theta_{fs})+\alpha_7\frac{T_{fc}\omega_{sl}}{2}\\
\dot{\theta}_{fs} &= \alpha_8(\theta_{cm}-\theta_{fs})-\alpha_9(1-\beta)(\theta_{fs}-\theta_h)
\end{aligned} \tag{5}$$

where θ_h is the ambient temperature assumed constant and α_i are the thermal parameters which need to be identified.

Due to the difficulties and costs to measure both the interface temperature and cushion spring temperature in a real system, results from Finite Element Analysis (FEA) (**Pisaturo & Senatore, 2016**) have been used to estimate the thermal parameters αi. Particularly, the same thermal power used as energy source in FEA model has been fed as input of thermal model described above.

Furthermore, both clutch material and cushion spring reference temperatures used for parameter estimation have been calculated at mean radius. For the sake of brevity, the readers can find details on thermal parameters, on thermal power input and how the latter has been calculated for the three analysed launch manoeuvres in (**Pisaturo & Senatore, 2016**).

Finally, In Figure 4 the mean and standard deviation of each parameter has been plotted. It is worth noting that, the main influencing phenomenon is the thermal conduction between clutch material and pressure plate (flywheel). Indeed, the two parameters 1 and 4 have the greatest values. Particularly, the parameter 4 features both the highest value and the highest uncertainty.

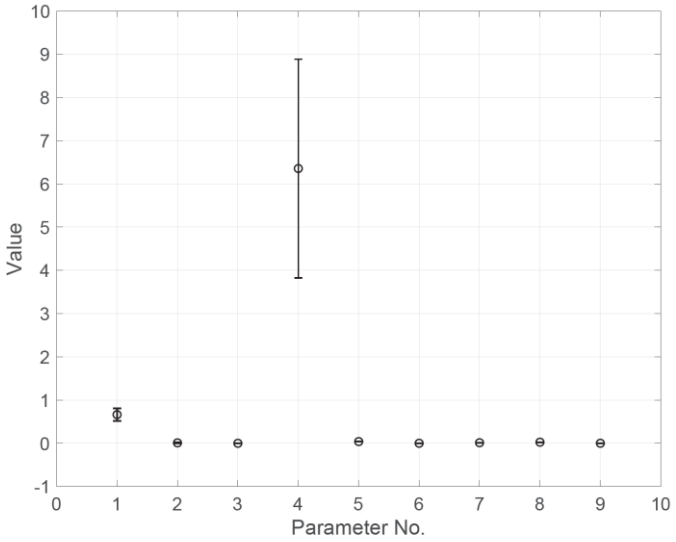

Figure 2 Estimated parameters: mean and standard deviation.

Electric motor model

As claimed before, this study aims at investigating the beneficial role of EM to limit temperature rise in dry clutch during HEV launch manoeuvre. Indeed, the EM activation enables torque delivery to traction wheels to accelerate the vehicle. In a simplified analysis, the EM dynamics does not involve any efficiency map to keep clear the benefit from EM activation and prevent complexity given by the coupling between clutch and EM thermal dynamics. In particular, a simple unitary gain, first-order transfer function with a time constant equal to 0.05 s has been used. In this way, the helpful role of the EM can be easily and directly compared to pure ICE mode.

According to the simulated driveline architecture, EM acts as an actuator which delivers the requested torque (third MPC output) to the driveline. In addition, the ICE power to drive the vehicle and charge the battery (motor becomes generator); the stationary charging mode and the regenerative braking mode have not been simulated in the framework of this paper. As future work, more inclusive HEV models will be analysed to encompass thermal management of driving motor and battery, as trade-off with thermal relief of clutch in EM control strategy.

Control Unit

In Figure 3, the control scheme is reported. The MPC generates the reference signals for engine, clutch and electric motor subsystems. Particularly, the reference engine torque (first MPC output), together with the measured engine angular speed; feed an inverted engine map in order to obtain a reference accelerator pedal signal. Instead, the reference clutch torque (second MPC output) is inverted by means of clutch model

to get the reference throwout bearing position. This signal, coupled to clutch actuator dynamics, has been used as an input to the detailed clutch torque transmissibility model, equation (4), to obtain the actual clutch torque signal ("plant" input). Finally, the reference electric motor torque (third MPC output) feed a unitary gain first-order transfer function with a time constant equal to 0.05 s which represents the electric motor dynamics.

To estimate the temperature rise during the engagement process, a thermal model based on equation (5) has been implemented in the control unit. The thermal model is fed with the reference clutch torque (second MPC output) and the measured engine and clutch angular speeds. Indeed, in automotive applications both the engine and wheel angular speeds, ω_e and ω_w, as well as the road load T_w are measured, (**Sharifzadeh et al., 2016**).

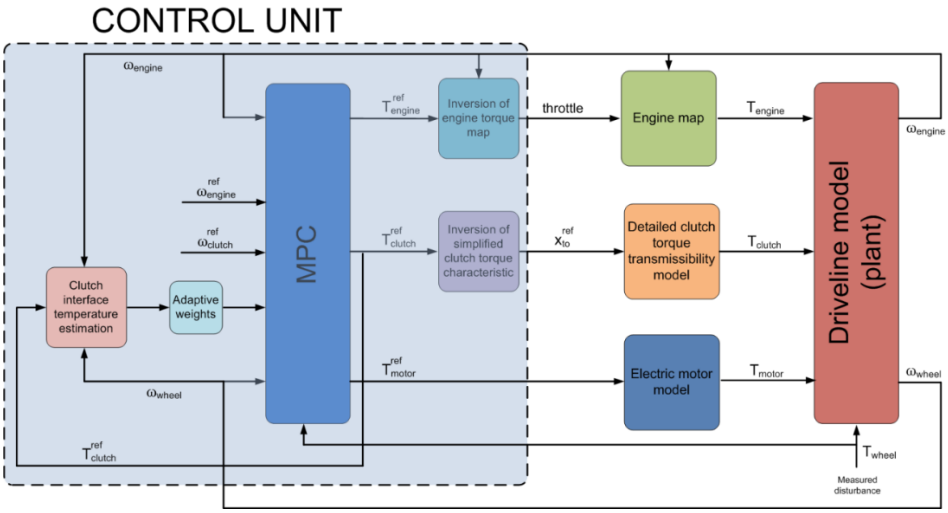

Figure 3 Control scheme.

Model Predictive Control Design

In this section, the model predictive control approach based on the work proposed in (**Pisaturo, Cirrincione & Senatore, 2015**) is depicted. The controller has been designed with the discrete time version of the driveline model by assuming a sampling time of 0.01 s and the zero-order hold method. This value is compatible with automotive current technology requirements (**Huang, Song & Li, 2011**).

Many studies pointed out that the higher thermal stress on clutch components is generated during the start-up manoeuvre whereas it is negligible during gear-shifts. For this reason, the driveline state-space model has been obtained by considering only the first gear. Moreover, all non-linarites such as the clutch and engine dynamics have been considered out of the MPC as look-up tables. Moreover, actuator delays

have been considered in the MPC design to improve controller performances.

The state-space representation used to design the MPC is reported below:

$$\begin{cases} \mathbf{x}_{k+1} = \mathbf{A}\mathbf{x}_k + \mathbf{B}_{MV}\mathbf{u}_{k-\tau(k)} + \mathbf{B}_{MD}\mathbf{v}_k \\ \mathbf{y}_k = \mathbf{C}\mathbf{x}_k \end{cases} \quad (6)$$

where $\mathbf{x} = [\omega_e\ \omega_w]^T$ is the state vector, $\mathbf{y} = [\omega_e\ \omega_c]^T$ is the output vectors and $\mathbf{u} = [T_e\ T_{fc}\ T_m]^T$ is the manipulated variables vector, $\mathbf{v} = [T_w]$ is the measured disturbance vector and ω_e and ω_w are the measured outputs of the controller.

The state matrix is $\mathbf{A} = \begin{bmatrix} -\frac{b_e}{J_{ef}} & 0 \\ 0 & -\frac{b_g (r_1 r_d)^2}{J_v} \end{bmatrix}$, the input matrix is $\mathbf{B} = \begin{bmatrix} \mathbf{B_{MV}} & \mathbf{B_{MD}} \end{bmatrix} = \begin{bmatrix} \frac{1}{J_{ef}} & -\frac{1}{J_{ef}} & 0 & 0 \\ 0 & \frac{r_1 r_d}{J_v} & s\frac{r_2 r_d}{J_v} & -\frac{1}{J_v} \end{bmatrix}$ and the output matrix is $\mathbf{C} = \begin{bmatrix} 1 & 0 \\ 0 & r_1 r_d \end{bmatrix}$.

Plant constraints

Some constraints both on the "plant" input and output have been selected to design the MPC and avoid the engine stall condition and provide comfortable lock-up at the same time. On the "plant" input saturation constraints have been imposed both on the torques:

$$-82 \le T_e \le 334 \quad Nm \quad (7)$$

$$0 \le T_{fc} \le 400 \quad Nm \quad (8)$$

$$0 \le T_m \le 140 \quad Nm \quad (9)$$

where -82 Nm and 334 Nm are the minimum and maximum engine torque values obtained from the engine static map. Moreover, 0 Nm and 400 Nm are the minimum and maximum torque values that the clutch can transmit. The maximum value has been assumed 20 % greater than maximum engine torque. Finally, 0 Nm and 140 Nm are the minimum and maximum torque values that the electric motor can generate. As introduced before, in this study only the pure electric mode has been considered and the regenerative phase has not simulated.

Besides, to avoid the engine stall condition and guarantee comfortable lock-up, some constraints have been adopted also on "plant" outputs, i.e. engine and clutch angular speeds.

$$80 \le \omega_e \le 500 \quad rad/s \tag{10}$$

$$\omega_c \ge 0 \quad rad/s \tag{11}$$

where 80 rad/s represents the so-called no-kill condition (Glielmo *et al.*, 2006), 500 rad/s is the maximum value of the engine speed before attaining critical conditions. Also these values have been obtained from the engine static map. Finally, 0 rad/s is the minimum clutch angular speed imposed to avoid reverse motion. It is worth noting that it is not necessary to impose a maximum clutch angular speed, because it is equal to the engine angular speed during the engaged phase and it can only decrease for passive resistance during the idle phase.

Optimization problem and tuning

The goal of the optimization problem is to minimize a cost function while satisfying constraints at each time step. As previously explained, the actuator delays have been considered in the MPC design. This affects the choice of both control and prediction horizon as follows:

$$p - m > \frac{\max(\tau_c, \tau_m)}{T_s} \tag{12}$$

where p is the prediction horizon, m is the control horizon, τ_c and τ_m are the clutch and electric motor actuator delays respectively and T_s is the sampling time. As mentioned above, the clutch actuator delay is 0.1 s and the sampling time is 0.01 s, thus the implemented values are p = 25, m = 1. The implemented cost function to be minimizes is:

(13)

$$F = \left[\mathbf{y}_j - \mathbf{r}_j\right]^T \mathbf{W}_{y,j}^2 \left[\mathbf{y}_j - \mathbf{r}_j\right] + \left[\mathbf{u}_i - \mathbf{u}_{target,i}\right]^T \mathbf{W}_{u,i}^2 \left[\mathbf{u}_i - \mathbf{u}_{target,i}\right] + \Delta\mathbf{u}_i^T \mathbf{W}_{\Delta u,i}^2 \Delta\mathbf{u}_i$$

where $\mathbf{u}_i$ is the input vector, $\mathbf{u}_{target,i} = [0, 0, T_{m,max}]$ is the input target vector, $\Delta\mathbf{u}_i$ is the input increment vector, $\mathbf{y}_i$ is the output vector, $\mathbf{r}_i$ is the set point trajectory vector. Finally, the subscript i and j take into account the i-th inputs and j-th outputs of the "plant" respectively.

According to working conditions, adjustable weights for "plant" inputs and outputs have been implemented to trigger on the electric motor when the estimated clutch temperature reaches the threshold value of 200 °C. Particularly, if the clutch temperature is lower than 200 °C the input weights are $\mathbf{W}_u$ = diag(0, 0, 0). On the contrary, when the clutch temperature overcomes 200 °C the input weights are $\mathbf{W}_u$ = diag(0, 0, 5). In this way, to minimize the second term of the cost function, the difference between the input vector and the input target vector should be zero, i.e. $T_m^{ref} = T_{m,max}$. It is worth noting that the weights of the first two inputs are zero. This means that their difference from the target values does not

affect the cost function. Finally, constant weights have been assumed for input increment $\mathbf{W}_{\Delta u}$ = diag(0.15, 0.10, 0.20) and output $\mathbf{W}_{y}$ = diag(1, 1).

Simulation Results

In this section, two scenarios of vehicle launch manoeuvre simulating heavy working conditions are presented. Particularly, in the first scenario, an initial temperature of 190 °C as a result of previous engagements is assumed whereas an initial temperature of 210 °C in the second scenario. Moreover, for both scenarios a road slope of 10 degree has been considered. In such circumstances, the amount of heat produced during the start-up manoeuvre could result in clutch material drawback. Moreover, repeated uphill launch makeovers in crowded traffic conditions, namely repeated clutch engagement in short time, are tangible danger to attain high interface temperatures and consequently clutch facings damage (**Feng, Yimin and Juncheng, 2010**). At this end, custom Matlab/Simulink model which takes into account a detailed dry clutch torque transmissibility model (i.e. by considering cushion spring thermal expansion and temperature-pressure-sliding speed dependent friction coefficient) has been implemented to simulate the longitudinal vehicle dynamics.

As previously explained, the control strategy penalizes the electric motor activation if the estimated clutch material temperature is less than 200 °C. In Figures 4, 5 and 6, results of the analysed launch manoeuvre are reported in pure ICE mode and HEV mode. With reference to the latter case, in Figure 4 is highlighted as after about 0.7 s the clutch angular speed slope is higher than the pure ICE mode. This is due to the electric motor activation which delivers more torque to the traction wheels, see Figure 5. This results in a decrease of both engine and clutch torque and consequently in a reduction of the thermal power generated during the slipping phase. Moreover, as shown in Figure 6, the activation temperature threshold is reached and there is the transition from pure ICE to hybrid propulsion, i.e. $T_m > 0$ (red line). Finally, in Figure 6 is shown as in the HEV mode clutch peak temperature is about 7 °C lower than the ICE mode.

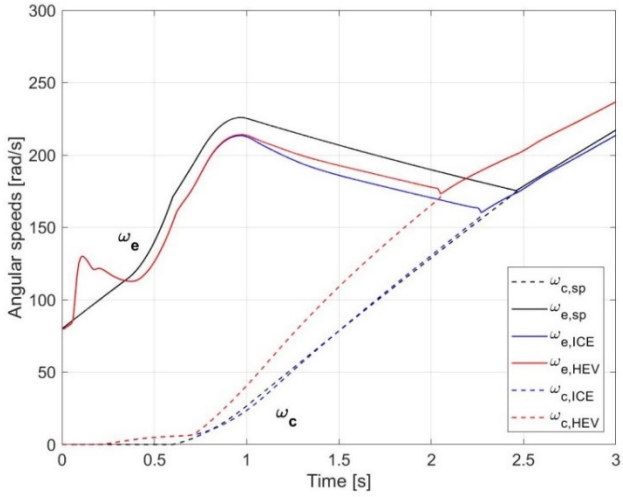

Figure 4 First scenario: engine and clutch angular speeds, set point trajectories (black lines), HEV mode (red lines), ICE mode (blue lines).

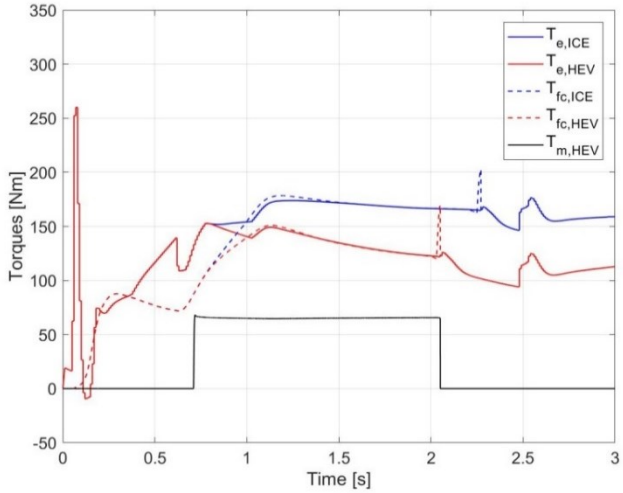

Figure 5 First scenario: engine, clutch and electric motor torques reduced to the engine shaft, HEV mode (red lines), ICE mode (blue lines) and electric motor torque (black line).

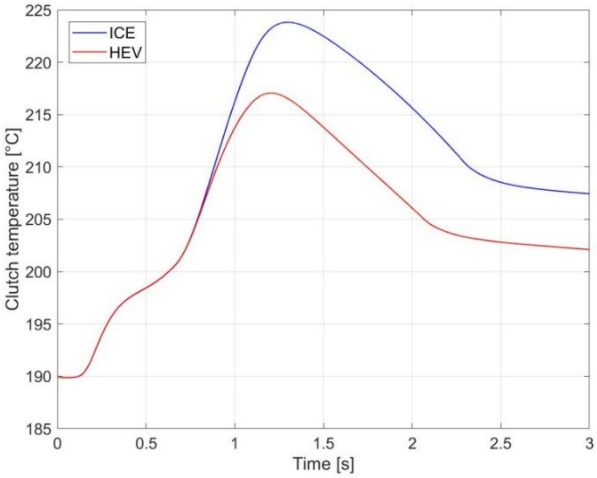

Figure 6 First scenario: clutch material temperature, HEV mode (red line), ICE mode (blue line).

In the second scenario, an initial clutch temperature equal to 210 °C is selected; so, the activation temperature has already been overcome after previous clutch operations. With the same arrangement of the figures as for previous case, the first obvious result is the switching-on of the electric motor ($T_m > 0$ in Figure 8) since the first instants, as the MPC control rapidly triggers the electric propulsion to comply with the discussed temperature onset. The clutch torque spikes at the end of the engagement phase, highlighted in Figure 5 and 8, occur because the difference between the engine and clutch angular speeds are lower than the threshold at which the clutch is considered locked-up. Consequently, the TCU drives rapidly the clutch actuator to its rest position. This could results into longitudinal vibrations but by adapting the threshold it is possible to reduce them. In our case, the aim is to reduce the clutch damage due to thermal stress thus slightly higher vibrations are accepted.

In Figure 9, it is shown the clutch material temperature rising around 33 °C in ICE mode, whereas the temperature rise in the same manoeuvre in HEV mode is only 18 °C: i.e. about 45% less than the clutch temperature increase in ICE mode.

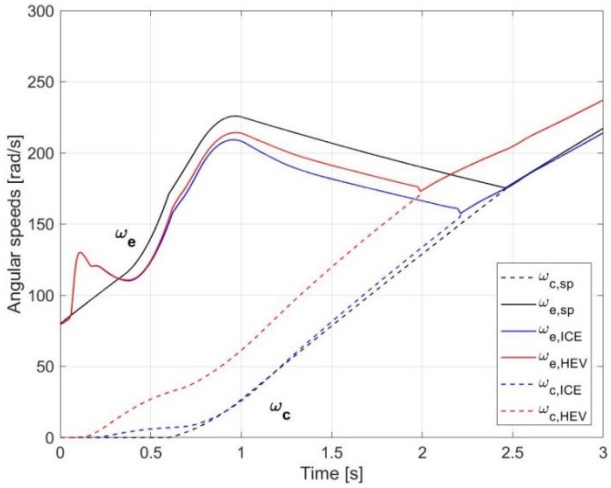

Figure 7 Second scenario: engine and clutch angular speeds, set point trajectories (black lines), HEV mode (red lines), ICE mode (blue lines).

Conclusions

This paper explores the benefits achievable in HEVs equipped with automated manual transmissions in preventing dry-clutch system from overheating problems. At this end, an investigation on the role of EM to minimize temperature rise in dry clutch AMT/DCT during the slipping phase is proposed. Simulations of start-up manoeuvre under hypothesis of initial temperature of 190 °C or 210 °C and road slope of 10 degree with and without electric propulsion aid have been carried out. The results

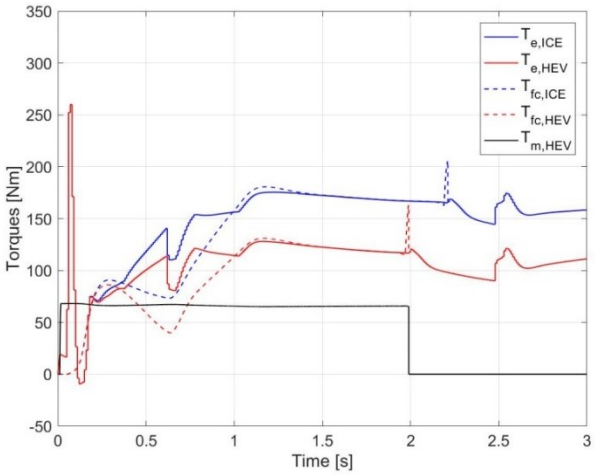

Figure 8 Second scenario: engine, clutch and electric motor torques reduced to the engine shaft, HEV mode (red lines), ICE mode (blue lines) and electric motor torque (black line).

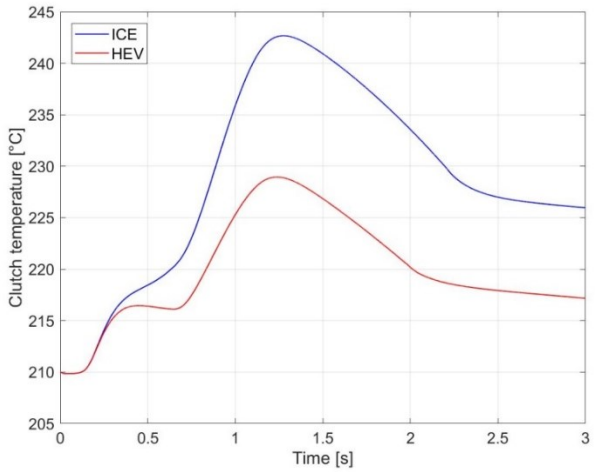

Figure 9 First scenario: clutch material temperature, HEV mode (red line), ICE mode (blue line).

underline lower temperature rise of clutch material in HEV mode: with the aid of EM, the reduction of clutch temperature attains 20% or even 45%, according to the given scenarios. Under this light, the electric motor activation remarkably prevents clutch overheating after repeated engagements. Future analyses will embody more complex HEV model to include also the thermal evolution of the electric motor as well as the battery status to explore optimal trade-off between the temperatures of such components with the required thermal relief of dry clutch system.

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References

Chan, C. C. (2007) 'The State of the Art of Electric, Hybrid, and Fuel Cell Vehicles', *Proceedings of the IEEE*, 95(4), pp. 704–718. doi: 10.1109/JPROC.2007.892489.

D'Agostino, V., Senatore, A. and Pisaturo, M. (2013) 'Improving the engagement performance of automated dry clutch through the analysis of the influence of the main parameters on the frictional map', in *5th World Tribology Congress*. Turin.

Feng, H., Yimin, M. and Juncheng, L. (2010) 'Study on heat fading of phenolic resin friction material for micro-automobile clutch', *2010 International Conference on Measuring Technology and Mechatronics Automation, ICMTMA 2010*, 3, pp. 596–599. doi: 10.1109/ICMTMA.2010.386.

Glielmo, L. *et al.* (2006) 'Gearshift control for automated manual transmissions', *IEEE/ASME Transactions on Mechatronics*, 11(1), pp. 17–26. doi: 10.1109/TMECH.2005.863369.

Huang, Q., Song, J. and Li, L. (2011) 'Research on rapid testing platform for TCU of automated manual transmission', *Proceedings - 3rd International Conference on Measuring Technology and Mechatronics Automation, ICMTMA 2011*, 3, pp. 67–70. doi: 10.1109/ICMTMA.2011.588.

Oh, K. *et al.* (2007) 'Optimization of control strategy for a single-shaft parallel hybrid electric vehicle', *Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering*, 221(5), pp. 554–565. doi: 10.1243/09544070JAUTO93.

Pica, G. *et al.* (2016) 'Dry Dual Clutch Torque Model with Temperature and Slip Speed Effects', *Intelligent Industrial Systems*. Springer Singapore, 2(2), pp. 133–147. doi: 10.1007/s40903-016-0049-6.

Pisaturo, M., Cirrincione, M. and Senatore, A. (2015) 'Multiple constrained MPC design for automotive dry clutch engagement', *IEEE/ASME Transactions on Mechatronics*. doi: 10.1109/TMECH.2014.2335894.

Pisaturo, M. and Senatore, A. (2016) 'Simulation of engagement control in automotive dry-clutch and temperature field analysis through finite element model', *Applied Thermal Engineering*, 93, pp. 958–966. doi: 10.1016/j.applthermaleng.2015.10.068.

Pisaturo, M. and Senatore, A. (2017) 'Launch maneuver in Hybrid Vehicle: Electric Motor assistance to limit Temperature Rise in Automated Dry Clutch', in *21st International Conference on Mechatronics Technology*. Ho Chi Minh City, Vietnam.

Pisaturo, M., Senatore, A. and D'Agostino, V. (2017) 'Could electric motor in HEV assist vehicle launch and relief dry clutch from thermal damage?', *IEEE/ASME International Conference on Advanced Intelligent Mechatronics, AIM*, pp. 327–333. doi: 10.1109/AIM.2017.8014038.

Pisu, P. and Rizzoni, G. (2007) 'A Comparative Study Of Supervisory Control Strategies for Hybrid Electric Vehicles', *IEEE Transactions on Control Systems Technology*, 15(3), pp. 506–518. doi: 10.1109/TCST.2007.894649.

Rakopoulos, C. D. and Giakoumis, E. G. (2009) *Diesel Engine Transient Operation*. Springer.

Sharifzadeh, M. *et al.* (2016) 'Vehicle tyre/road interaction modeling and identification of its parameters using real-time trust-region methods', *IFAC-PapersOnLine*. Elsevier B.V., 49(3), pp. 111–116. doi: 10.1016/j.ifacol.2016.07.019.

Tribioli, L. *et al.* (2014) 'A real time energy management strategy for plug-in hybrid electric vehicles based on optimal control theory', *Energy Procedia*. Elsevier B.V., 45, pp. 949–958. doi: 10.1016/j.egypro.2014.01.100.

Vagg, C. *et al.* (2016) 'Stochastic Dynamic Programming in the Real-World Control of Hybrid Electric Vehicles', *IEEE Transactions on Control Systems Technology*, 24(3), pp. 853–866. doi: 10.1109/TCST.2015.2498141.

Vasca, F. *et al.* (2011) 'Torque transmissibility assessment for automotive dry-clutch engagement', *IEEE/ASME Transactions on Mechatronics*, 16(3), pp. 564–573. doi: 10.1109/TMECH.2010.2047509.

Wang, J. *et al.* (2015) 'Hybrid electric vehicle modeling accuracy verification and global optimal control algorithm research', *International Journal of Automotive Technology*, 16(3), pp. 513–524. doi: 10.1007/s12239-015-0053-y.

Ye, X. *et al.* (2013) 'Modeling and control strategy development of a parallel hybrid electric bus', *International Journal of Automotive Technology*, 14(6), pp. 971–985. doi: 10.1007/s12239-013-0107-y.

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Is there an I in Impact? Considering the two-way process of public engagement.

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Abstract

This article is a critical reflection on public engagement and the concept of impact in UK research institutions, based on a recent experience. The UK impact agenda, driven by the Research Excellence Framework (REF)[i], requires researchers to engage with the public in order to potentially have an impact on society. This, I argue, constitutes the implicit directionality of impact as a one-way process. Recently, I provided a workshop for Flemish Sign Language (VGT) interpreters entitled 'I interpret, therefore I am' at the Faculty of Arts of the KU Leuven (Antwerp, Belgium). The aim of the workshop, in line with the impact agenda, was to increase participants' awareness about the interpreting process and change their perception of how an interpreter's personal beliefs potentially influence his/her linguistic choices. However, interacting with the participants also had an impact on my current research design and me as a researcher. This particular experience led me to reconsider the implicit idea of impact as a one-way process. In what follows I argue that, impact can and - in my opinion - should be a two-way process, encouraging interaction with the public in order to have a valuable impact on society, research and the researcher.

Keywords: REF; impact; public engagement; critical reflection; sign language; research design

Impact in UK Academia

As a new and European scholar at the University of Warwick I have been introduced to the UK's 'impact agenda' as part of the REF, an evaluation system used to assess the quality of research carried out in UK higher education. The outcomes of the evaluation are used to inform the allocation of public funding for universities' research. One criterion of evaluation is the impact academic research has on the larger (i.e. non-academic) public.

The UK Research and Innovation (UKRI) body distinguishes between (1) academic impact and (2) economic and societal impact. Defining the former as:

> *The demonstrable contribution that excellent research makes to academic advances, across and within disciplines, including significant advances in understanding, methods, theory and application.* (**UKRI, 2019a**)

The latter refers to:

> *The demonstrable contribution that excellent research makes to society and the economy. Economic and societal impacts embrace all the extremely diverse ways in which research-related knowledge and skills benefit individuals, organisations and nations (…)* (**ibid**)

UKRI also makes a distinction between (1) economic impact and (2) societal and cultural impact (**UKRI, 2019b & c**). The first type is *delivered*, whereas the second one is *created*. Ultimately, it is their vision to maximise the impact of public investment in research. In similar fashion, the mission states that taxpayers' money will be invested wisely in a way that generates impact for citizens (**UKRI, 2019d**).

Whereas the UKRI and the former Research Councils UK emphasise the benefits of engaging with the public and potential impact for researchers (**RCUK, 2010**), these are not explicitly addressed by the University of Warwick, where I am currently a research fellow. The university seems to mainly focus on how research can bring about change in society, highlighting the economic and societal dimension of impact and putting lesser emphasis on academic impact. The university's webpage clarifies that 'impact is a dynamic concept that is evolving' (**Warwick, 2019**) and that they take impact to mean:

> *"…the identifiable and evidenced contribution made by universities to the economy and society."* (**ibid**)

It goes on to say that an effective and efficient two-way relationship with stakeholders is required in order to achieve the potential impact of research. However, the university's webpage does not elaborate on what this relationship entails or how it affects both parties.

The fact that the governmental institutions and the university primarily address impact as academia's contribution to society made me (re)consider impact as a two-way process. Not only acknowledging how research can change society, but also regard how the non-academic audience can have an impact on research? My recent experience engaging as a researcher with a non-academic public during an impact activity reinforced this idea.

There are several identifiable benefits of public engagement, one of the ways to obtain impact, for researchers. As mentioned, some of the advantages have been outlined in a Research Councils UK brochure *What's in it for me?* (**RCUK, 2010**). The brochure primarily focuses on how engaging in impact activities will enhance a researcher's career by raising his/her personal profile and improving specific skills such as communication and influencing. However, when I argue that impact should be approached as a two-way process, I suggest that academia should not only ask what research can do for the public, but also what the public can do for research.

There are various ways to adopt a bidirectional philosophy on impact in different stages of a research project. A research idea can be informed or even proposed by the general public, which flags a certain issue that warrants academic attention. This can result in a community-based participatory research project where the non-academic group is not limited to being a beneficiary of the research but is treated as an equal partner, informing and forming the project. Another possibility lies in close consultation with the public at the conception stage of a research idea. Listening to, involving and interacting with a non-academic audience can improve the quality of research questions and/or hypothesis. The public views might offer fresh perspectives on the topic and allow the researcher to take on board ideas he/she might not have considered. Similarly, consulting the general public can allow to tease out research ideas and assess the feasibility of a project. At the conclusion of a research project it might be valuable to present research results to the general public and engage them in the interpretation of the findings. Not only can this kind of interaction help to improve the quality of the research and ground it within society, it potentially feedbacks into new research questions. Engaging with the public can be a springboard for new research that from the onset is informed and supported by the public. Ultimately, these suggestions to ensure the two-way process of impact will increase the impact the research has on society, research and the researcher.

Impact Activities

As mentioned, one way to achieve impact is through public engagement, i.e. communicating research to a non-academic audience. However, this in itself does not constitute as impact as defined by the University of Warwick. It is not sufficient to talk about or share insights based on your research with non-specialists. In order to achieve impact, the activity has to have made a demonstrable change. Generally this change is measured through an evaluation, establishing whether attendees' knowledge has shifted. And if so, whether this will influence future behaviour.

One example of a valid impact activity is giving a research-informed workshop to a non-academic audience. In May 2019 I was invited to provide a workshop at the 10th anniversary of the association of VGT (Flemish Sign Language) interpreters (BVGT)[ii]. The event was held at the KU Leuven, Faculty of Arts in Antwerp (Belgium) and convened VGT interpreters, interpreter educators, deaf and hearing interpreter consumers, and leaders from the Deaf and interpreting community. I provided an interactive workshop based on my PhD and current postdoctoral research. My PhD project describes which linguistic interpreting strategies VGT interpreters use when interpreting from Dutch into Flemish Sign Language and also explores the interpreters' underlying motivations to use certain strategies[iii]. My postdoctoral project examines if and how ideologies on deafness, disability, and language influence linguistic decisions signed language interpreters make[iv].

Workshop *I interpret, therefore I am*: The set up and aims

The workshop ran twice and per session maximum fifteen participants were allowed. Both sessions were conducted in Flemish Sign Language (VGT) since that was the shared language between the participants (deaf and hearing) and myself.

In the spirit of public engagement and the impact agenda, I wanted to inform the audience about and possibly change their understanding of the interpreting process and how their own beliefs can potentially influence that process. At the same time, I saw the workshop as an opportunity to tease out some preliminary research findings and ideas concerning my postdoctoral study. I aimed to (1) increase the participants' awareness of the strategic nature of interpreting, (2) expand their knowledge of linguistic interpreting strategies, (3) spark apprehension of how personal beliefs can influence the linguistic decisions interpreters make, and (4) test preliminary findings and a research hypothesis.

The workshop consisted of four parts: (1) an icebreaker, (2) a theoretical introduction to interpreting as a strategic process, (3) a hands-on and reflective exercise, and (4) a creative conclusion.

The icebreaker was a short activity introducing the topic. The participants were divided in groups and handed a card on which the word *interpreter* was printed. They had ten seconds to perform a tableau vivant. This encouraged the participants to quickly decide on what *interpreter* means to them. Since all of the attendees knew VGT and this task allowed non-verbal expression, many of the groups used the sign for *interpreter*[v] in

their tableau vivant. One group presented their understanding of the concept as follows:

Figure 1: Tableau vivant of the concept 'interpreter'. Source: author's personal image.

In the middle you can see the man's right hand and the woman in the floral dress's left hand jointly producing the sign for *interpreter*. The woman's right hand symbolises signed language whereas the other woman is demonstrating spoken language. This particular scene captures several characteristics of the *interpreter*; (1) being in between two people and languages, (2) the spoken and signed working modalities, and (3) collaboration. The tableau vivant allowed the participants to discover their view of *interpreter* in a creative and playful manner.

The second part of the workshop was a theoretical introduction to linguistic interpreting strategies, the results of my PhD study, and the idea of interpreting as a strategic process. In order to ensure that all participants departed from the same knowledge base, I presented an overview of (1) the Effort Models (**Gile, 1995 (revised 2009); 2018**), (2) the sociolinguistic model of sign language interpreting (**Cokely, 1992**), and (3) interpreting as a goal-oriented process (**Pöchhacker, 2004**). In his models, Gile foregrounds the cognitive and psycholinguistic aspects of interpreting, whereas Cokely broadens the perspective by taking into

account the sociolinguistic aspects of communication. The theoretical framework put forward by Pöchhaker seeks to unite both models and gives significance to interpreting as a cognitive an interactive discourse information processing activity.

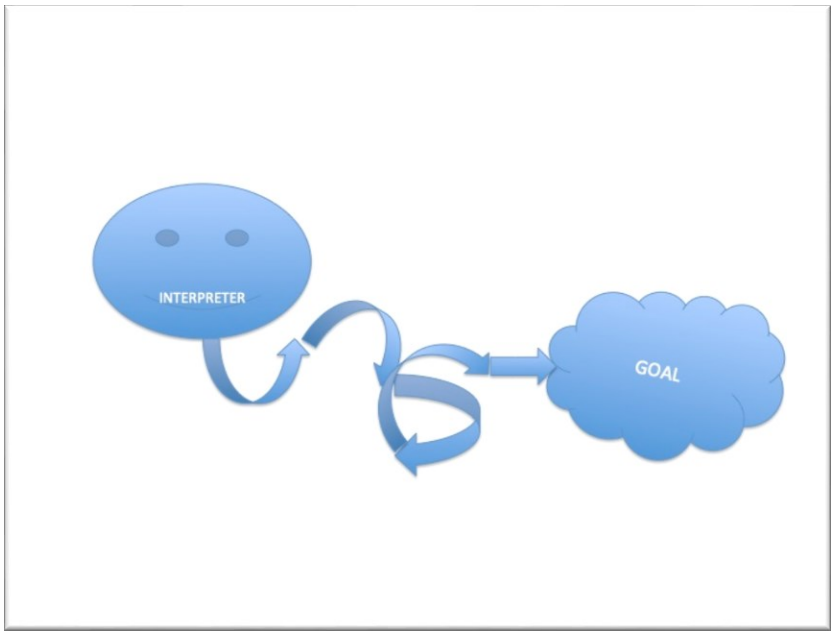

Figure 2: Interpreting as a goal-oriented process. Source: author's personal image.

I encouraged the audience to reflect about their understanding of the interpreting process by presenting the following yes – no-statements:

1. interpreting is a cognitive process
2. interpreting is a goal oriented process
3. interpreters make linguistic decisions
4. interpreting is strategic in nature

The participants were invited to express their agreement or disagreement by a show of hand and – if not everyone held the same view – to clarify their position.

Subsequently, I presented an overview of linguistic interpreting strategies and of motivations for using these strategies based on the results of my PhD research (**Heyerick, forthcoming**).

The third part of the session allowed the participants to put theory into practice. In groups of maximum three, each interpreted a Dutch text[vi] (containing statements on deafness, signed languages and interpreting) into Flemish Sign Language while the other person(s) observed the interpretation and wrote down the used strategies. After ten minutes, the observer(s) and interpreter discussed the strategies and why the

interpreter used them. This was repeated until each participant interpreted a fragment and discussed the strategies. This approach allowed for participants to (1) observe and identify strategies, (2) talk about strategies, (3) think about why a certain strategy is used, (4) explore what motivates certain choices, and (5) have a peer discussion. At the same time it allowed me to (1) assess the participants' knowledge and understanding of linguistic interpreting strategies, (2) interpret the results of my PhD study, (3) evaluate if the methodology works and can be reiterated, and (4) confirm or contradict preliminary findings of my postdoctoral project.

Figure 3: The Interpreter/Observer Task. Source: author's personal image.

The workshop was concluded by a brief group discussion after which I asked the participants to draw their self-portrait as an interpreter. Based on their experience of the interpreting task and the discussions, I wanted them to visually represent how this (re)shaped their image of '*I, the interpreter*'.

Figure 4: Participants' Self-Portraits as 'interpreter'. Source: author's personal image.

Workshop *I interpret, therefore I am*: The impact

One of the requirements of impact, as it is conceptualised within the REF, is that it needs to be identifiable and evidenced. Keeping this in mind, participants were invited to fill out an online evaluation form a couple of days following the workshop. Out of twenty-nine participants only seven did so. Along with general feedback, people were asked if the workshop had provided them with new insights and if so, which ones. Five out of the seven respondents indicated that this was the case. Additionally, the form also inquired whether the attendees learnt something during the session that they can apply in their professional or personal life. To this question three persons responded affirmative. During and after the workshop participants also shared that they had gained new insights about the interpreting process and in particular about how their beliefs about interpreting and language inform the strategic decisions they make. Some of them referred to the session as an 'Aha-experience'. During break-time conversations participants expressed that they particularly appreciated the theoretical discussion, the peer-support, the open and collaborative feedback and the time and space they were offered to think about interpreting. They felt that these aspects lack in their current professional development. Many of them requested a full day repeat of this workshop, which was also mentioned in the feedback forms (five out of seven respondents). These responses show that the workshop allowed me to engage with and potentially have an impact on my audience.

As a researcher, I felt challenged and validated by the event and the interaction with the participants. First of all, since some aspects of the theoretical framework I presented were unexpectedly challenged I had to reconsider what I assumed to be common knowledge. I believed that the fact that an interpreter is a participant in the interpreted interaction and has agency is accepted knowledge. However, participants' statements such as 'as an interpreter I do not have a voice', or 'I only interpret', and 'I do not have a goal as an interpreter' challenged this assumption. Some attendees subscribed to the, in academia out-dated and rejected, idea of the interpreter as a conduit, a neutral translating machine. This in turn made me question the actual impact of impact. The conduit model in interpreting stems from the 1980s and has been overturned since the sociolinguistic shift in interpreting studies in the 1990s. The 'myth of neutrality' has been addressed and unveiled by scholars since the seminal work of Metzger (**1999**). Bearing in mind that most interpreting studies' scholars are interpreters themselves and interpreting educators, some participants' comments reminded me that there is nonetheless still a substantial gap between academia and the community of practitioners. This realisation reinforced the idea that engaging with non-academic audiences is necessary and that it is indeed a task of academia to do so.

At the same time I was able to present and discuss the results of my PhD research, which resulted in fresh perspectives on what constitutes as a linguistic interpreting strategy. The interaction also enhanced my understanding of some inductive theoretical ideas. Additionally, I was able to test the methodology for my postdoctoral study and, based on the participants' feedback, implement some changes. Finally, I could tease out a research idea and approach, which was validated by the attendees' confirmation of preliminary findings.

On the one hand the workshop increased the audience's awareness and made them reconsider their concept of interpreting. On the other hand engaging with the public also challenged and validated the research. This, in my opinion, shows how impact can –and should- be a two-way process.

Conclusion

Whereas the institutional discourse surrounding public engagement and impact mainly stresses the change research can initiate in non-academic society, this personal experience made me realise that impact can and should be a two-way process. On the one hand the workshop reported on in this paper, intended to engage with and potentially impact its audience. However, at the same time I hoped that the interaction would enhance my understanding of some inductive theoretical ideas. In the end, this particular activity made an impact not only on the participants,

but also on my research and myself as an academic, demonstrating that indeed an effective and efficient two-way relationship with stakeholders is required in order to achieve the full potential of impact.

Acknowledgments

I would like to acknowledge Prof. Liddicoat for his comments on earlier drafts.

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Figure 1: Tableau vivant of the concept 'interpreter'. Source: Author's personal collection.

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Figure 4: Participants' Self-Portraits as 'interpreter'. Source: Author's personal collection.

Isabelle holds a MA in Linguistics and a MA in Interpreting (Dutch – English – Flemish Sign Language). Her area of expertise is signed language interpreting. Her PhD is a first exploration of which linguistic interpreting strategies Flemish Sign Language interpreters use and why. Her current postdoctoral research investigates how certain discourses and ideologies influence the linguistic decisions signed language interpreters make in their actual practice. She is the secretary of the World Association of Sign Language Interpreters and the vice-president of Tenuto, an organisation offering continuous professional development to sign language interpreters.

References

Cokely, D. (1992). *Interpretation: A sociolinguistic model*. Burtonsville, MD: Linstok Press.

Gile, D. (1995, revised 2009). *Basic Concepts and Models for Interpreter and Translator Training*. Philadelphia: John Benjamins.

Gile, D. (2018). *The Effort Models and Gravitational Model. Clarifications and update.* https://www.cirinandgile.com/powerpoint/The-Effort-Models-and-Gravitational-Model-Clarifications-and-update.pdf [Accessed 10th September2019].

Heyerick, I. (forthcoming). *A descriptive study of linguistic interpreting strategies used by Flemish Sign Language (VGT) interpreters. Understanding the what, how, and why*. Doctoral dissertation. KU Leuven, Antwerp, Belgium.

Metzger, M. (1999). *Sign language interpreting: Deconstructing the myth of neutrality*. Washington, D.C: Gallaudet University Press.

Pöchhacker, F. (2004). *Introducing Interpreting Studies*. Routledge.

RCUK, 2010. *What's in it for me? The benefits of public engagement for researchers*. Swindon: Research Councils UK. https://www.ukri.org/files/legacy/scisoc/rcukbenefitsofpe-pdf/ [Accessed 28th June 2019].

UKRI, 2019a. *Pathways to Impact*. Swindon: UK Research & Innovation. https://www.ukri.org/innovation/excellence-with-impact/pathways-to-impact/ [Accessed June 27th 2019].

UKRI, 2019b. *Delivering Economic Impact*. Swindon: UK Research & Innovation. https://www.ukri.org/about-us/strategic-prospectus/delivering-economic-impact/ [Accessed 27th June 2019].

UKRI, 2019c. *Creating Social and Cultural Impact*. Swindon: UK Research & Innovation. https://www.ukri.org/about-us/strategic-prospectus/creating-social-and-cultural-impact/ [Accessed June 27th 2019].

UKRI, 2019d. *Vision, Mission and Values*. Swindon: UK Research & Innovation. https://www.ukri.org/about-us/strategic-prospectus/vision-mission-and-values/ [Accessed June 27th 2019].

Warwick, 2019. *Impact*. Coventry: University of Warwick. https://warwick.ac.uk/services/ris/impactinnovation/impact/ [Accessed June 27th 2019].

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Endnotes

[i] https://www.ref.ac.uk

[ii] Beroepsvereniging van Vlaamse Gebarentaal Tolken

[iii] https://strategicinterpreting.blog

[iv] https://warwick.ac.uk/fac/cross_fac/ias/iaspeople/fellows/wirl

[v] http://gebaren.ugent.be/alfabet.php?id=18828

[vi] The selected text was a transcript of a Flemish Parliament hearing on the legal actions the Flemish Deaf Association (DoofVlaanderen) and several deaf individuals plan against the Flemish government with regard to VGT interpreting service provisions: https://www.vlaamsparlement.be/plenaire-vergaderingen/1316591/verslag/1317540/persoon/bart-van-malderen, accessed July 2nd 2019

Challenging Binaries and Unfencing Fields: An Interview with Bryan Cheyette

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Abstract

Bryan Cheyette is Professor of Modern Literature and Culture at the University of Reading, where he directs the Identities and Minorities research group. His comparative research focuses on critical 'race' theory, postcolonial literature and theory, diasporic literature, Holocaust testimony, and, more recently, the social history of the ghetto. In January 2019, the Warwick Memory Group invited Bryan Cheyette to give a public lecture on 'The Ghetto as Travelling Concept', in the light of his forthcoming A Very Short Introduction to the Ghetto *(2020), and a workshop on 'Unfenced Fields in Academia and Beyond'. In a wide-ranging interview, Bryan Cheyette speaks of the interconnections between Jewish studies and postcolonial studies, bringing these into dialogue with memory discourses and our contemporary moment.*

Keywords: postcolonial studies; global studies; memory studies; Jewish studies; Holocaust studies; ghetto; diaspora; cosmopolitanism; world literature

Introduction

In their introduction to a special issue on Jewish studies and postcolonialism, published in *The Cambridge Journal of Postcolonial Literary Inquiry*, Willi Goetschel and Ato Quayson write that:

> *Jewish studies has received new impulses from postcolonial critique just as postcolonial discourse has found inspiration in the work and thought of Jewish critics and intellectuals. But rather than the assimilation of paradigms from each other's discourse, we need to gain a better understanding of their interface* (**2016: 3**).

Here there is a sense of both interaction and reflection, on and of the other. This is demonstrated in a lively exchange stimulated by a paradigm article by Bryan Cheyette (**2017**), in which leading scholars explore what Nils Roemer calls 'the intersectionality of Jewish and postcolonial studies', premised on '[p]lurality instead of singularity' (**2018: 124**). Both of these fields deal with memory, and therefore bringing them into dialogue with the burgeoning field of memory studies – closely related to trauma studies and Holocaust studies – is a productive exercise (**Roca Lizarazu & Vince, 2018**). Perhaps it is a helpful analogy to think of these fields – postcolonial studies, Jewish studies, memory studies, trauma studies – as not fenced in or enclosed but open, wild, 'ill-disciplined' fields with unclear boundary lines (**Cheyette, 2009: 1–2**). Rather than supplanting one another, these fields overlap, intersect, and cross-pollinate. As Roemer writes, 'the field of Jewish and postcolonial studies [...] exists as a multidisciplinary field of intersection between disciplines across the globe' (**2018: 124**). These intersections are facilitated by what Mieke Bal calls 'travelling concepts' (**2000**), which might in turn be related to 'traveling culture' (**Clifford, 1986; 1992**), a concept Astrid Erll draws on to conceptualize 'travelling memory' (**2011**). Erll writes that 'much of the actual semantic shape that travelling memory takes on will be the result of the routes it takes in specific contexts and of the uses made by specific people with specific agendas' (**2011: 15**), as evidenced in diasporic memories and ghettoization.

In January 2019, the Warwick Memory Group invited Bryan Cheyette to give a public lecture on 'The Ghetto as Travelling Concept', in the light of his forthcoming *A Very Short Introduction to the Ghetto* (**2020**). He also gave a workshop on 'Unfenced Fields in Academia and Beyond: Jewish/Postcolonial/Memory Studies' in which participants had the opportunity to discuss his paradigm article 'Against Supersessionist Thinking: Old and New, Jews and Postcolonialism, the Ghetto and Diaspora' (**2017**) alongside the responses (**Rothberg, 2018; McLeod, 2018; Robins, 2018; Freitas, 2018**) and his own response to these (**Cheyette, 2018a**). The Warwick Memory Group partnered with the

Frankfurt Memory Studies Platform to interview Bryan Cheyette on the occasion of his visit. In the interview, presented below, Bryan Cheyette highlights the many overlaps between Jewish studies and postcolonial studies, ranging from interrelated (diasporic) histories to the shared experience of the everyday nature of racism in liberal societies. For Cheyette, Hannah Arendt's *Origins of Totalitarianism* (**1994 [1951]**), forms the key text that brings such interconnections to the fore, effectively practising 'intersectionality *avant la lettre*' (p. 4). Consequently, the future of both fields of study lies outside the disciplines, and in practising thought and criticism that actively cut across histories, subjects, and cultures. With reference to Theodor Adorno and Edward Said, Cheyette argues for a form of intellectual, 'thinking' activism, whereby the role of the academic is to bring together nuanced thought and critical engagement rather than reinforce the manicheanism of contemporary politics. The histories of genocide, colonialism, exploitation, marginalization, and everyday racism cannot and should not be excluded from our understanding of self and other, and of our disciplines, but rather incorporated in criticism, teaching, and 'thinking' activism.

Interview

Rebekah Vince (RV): What can Jewish studies and postcolonial studies learn from one another?

Bryan Cheyette (BC): I have shown in a number of pieces and most prominently in *Diasporas of the Mind: Jewish and Postcolonial Writing and the Nightmare of History* (**2014**) that Jewish and postcolonial studies have a great deal in common. Precolonial histories include many different diasporas which interconnect. Different colonial and precolonial cultures again show the ways that Jewish communities can be related and interrelated with all kinds of other communities – in South Asia, in Africa, and in the Iberian Peninsula, for instance. So, there is one way of thinking about history outside of national cultures which brings together Jewish and (post)colonial studies. My starting point has tended to be the 1940s, at the height of colonial rule and at the height of Nazism. What I've explored is how anti-colonial thinkers learned from the history of fascism, particularly the Jewish experience, and applied it to their own experience. Jews, who were victims of fascism, also looked at the experience of colonialism and applied it to their own experience in the ghettos and the camps. The kinds of distinctions between Jewish history and colonial history which exist now did not exist then. So, you mentioned Albert Memmi, for instance, who was a figure who could

write easily about colonialism, about antisemitism, about the outsider and, in general, about the experience of being a minority. He didn't really distinguish between these life-experiences. And figures like Aimé Césaire and Frantz Fanon, and most importantly Hannah Arendt in *The Origins of Totalitarianism* (**2017 [1951]**), also bring together the history of colonialism and the history of antisemitism. This was intersectionality *avant la lettre*.

That's a long way of saying that fascism, colonialism, antisemitism, and racism were thought of as intertwined up until the 1960s. With the rise of Holocaust studies and postcolonial studies in the 1980s, these 'knotted histories' – as Paul Gilroy put it (**2004: 78**) – became disciplined. What I have always believed is that it is precisely because postcolonial studies has so much in common with Jewish and Holocaust studies that it had to distinguish itself. There was a kind of anxiety of influence that Jewish studies was more established than its newer counterpart, more comfortable within the Western tradition – the term Judeo-Christianity was becoming prevalent again after the Holocaust, even though it is a meaningless term. It was a term that was used by the radical right, by Thatcher and Reagan, as well as postcolonialists, to talk about a dominant Western 'civilisation'. Postcolonial studies understandably distinguished itself from a conventional Jewish studies. Jewish studies also did not want to be too closely associated with postcolonial studies, because postcolonial studies was transgressive, and was broadly anti-Western, anti-European. Conventional Jewish studies did not want to be tarred with the same transgressive brush. It actually wanted to be respectable and acceptable, although this was not true of Holocaust studies, as many survivors were to question the basis of European civilisation where genocide was always a potential. But, broadly speaking, both sides were quite happy to have nothing in common.

What can they learn from each other? I personally learned a great deal from the founding postcolonial theorists. Robert Young called them the 'Holy Trinity' (**1995: 163**) – Edward Said, Homi Bhabha, Gayatri Chakravorty Spivak. They all spoke to me in different ways. Spivak's construction of the silence of the subaltern – how can the subaltern speak? (**1988**) – helped me think about Holocaust studies, the question of silence and the question of speaking for the victims. Said helped me because *Orientalism* (**1978**) constructed racial discourse in ordinary, quotidian terms. That is how I thought about antisemitism in liberal culture – as something that was everyday and mainstream rather than extreme and at the margins of society. One main reason why antisemitism is incorrectly thought of as being exceptional is that it is assumed to be at the extreme end of racial discourse, leading to the gas chambers at Auschwitz-Birkenau. Now racial discourse in its most

extreme totalitarian form – within Nazism, within Stalinism – can work in that way. But quite often, and especially within liberal cultures, it doesn't work that way. What I learned from Said is the everyday nature of racial discourse. What I learned from Bhabha (**1983**), together with Zygmunt Bauman (**1991**), although they don't engage with each other's work, is the question of the ambivalence and the complexity of racial discourse within mainstream liberal culture.

Hanna Teichler (HT): What role does memory studies play in your research?

BC: I come to memory studies via Holocaust studies. I was the first to teach a university course on Holocaust testimonies in Leeds in 1988. Other courses followed, most notably that taught by W. G. Sebald at the University of East Anglia, but I was there at the start in the UK at least. Memory studies to some extent comes out of Holocaust studies. I will leave the question of the foundational nature of Holocaust studies until later, but, for the moment, we can agree that the question of memory is absolutely at the centre of the most important Holocaust testimonies – Primo Levi has a crucial essay on the 'memory of the offence' (**2013 [1986]**); Charlotte Delbo (**2001 [1990]**) is tremendously important in distinguishing between superficial memory and bodily memory. Jorge Semprún (**1994**) illustrates the necessity of sixteen years of forgetting before he could remember his time in the camps. So, there's the question of memory and forgetting, as the weight of representing the victims' camp experience bears down on all great Holocaust testimonies. If you read these testimonies, memory is something that is uncertain. I call it 'Levi's ethical uncertainty' in my article on Primo Levi (**Cheyette, 1999**). It is the uncertainty of these memories that is crucial and helps me to think about memory studies. That is why I don't regard the Holocaust and Holocaust studies as foundational. I know that memory studies has followed the Holocaust, but Holocaust testimonies are uncertain, they are always unsure about memory. Testimonies are well aware of the impossibility of actually remembering or completely remembering, if you will. The anxiety is that they are not doing justice to the dead. Delbo's distinction between superficial and deep memories is crucial here. What Delbo says is that she lives next to her experience; the experience is not within her. The reason she says that is because if her camp experience is triggered it takes her over completely. It consumes her bodily. This is why Semprun couldn't write for sixteen years as his memories, paradoxically, were so physically traumatising that they prevented him from writing. He wrote a book called *Literature or Life* (**1994**) as this was his only choice. He could only write after he had forgotten his experiences after sixteen years or, at least, created enough distance between his experiences and his narratives. He could only live by forgetting, as re-living his experiences

in 'literature' disabled him completely. So, forgetting is just as important as remembering. Levi, in his testimonies, often talks about the moments when he is unable to remember, about forgetting, which, paradoxically, become his memories. He always tries to do justice to a fleeting moment of conversation, even though he will have forgotten most of it. What I have learned from Holocaust studies is that the question of forgetting, and the uncertainty of memory, the bodily nature of traumatic memory, is not easily accommodated by memory studies.

RV: Is there a history of combating both racism and antisemitism together?

BC: Yes. Absolutely. Such intersectional anti-racism is a necessity, not a luxury. Again, Arendt's *Origins of Totalitarianism* (**1994 [1951]**) is deeply influential in the 21st century precisely because it anticipated an intersectional approach. It was rejected, certainly by the left, in the context of the Cold War, because Arendt was dismissed as being on the side of the West. But if you look at the publishing history of the *Origins of Totalitarianism,* the chapter on totalitarianism was added last and it was very much at the publisher's request. In some ways, the book from the beginning was a tool of the Cold War, even though the important sections – the first two on colonialism, colonial history and the history of antisemitism – are key. The last section, which puts the first two in the context of totalitarianism, is important, but was misread in relation to the Cold War. Arendt was most concerned with fascist rather than Stalinist totalitarianism. Following Arendt, you have a number of figures who bring together questions of (anti-Black) racism and colonialism. Fanon is a prime example, who compared both in *Black Skin, White Masks* (**2017 [1952]**). He was influenced by Jean-Paul Sartre who, in *Anti-Semite and Jew* (**1995 [1948]**), had begun to theorise French antisemitism. This work is referred to throughout *Black Skin, White Masks*. Quite a number of anti-colonial thinkers start with antisemitism as a way of accessing their own history of racist oppression. Aimé Césaire (**2000 [1972]**) is a key example who conceived of fascism as colonialism brought home to Europe. These anti-colonial intellectuals are followed by more contemporary thinkers. Gilroy's *Between Camps* (**2004**), for instance, is an influential work that follows on from the last chapter of *The Black Atlantic* (**1993**), which brings together Jewish and Black nationalism. Following Gilroy and the Arendtian turn at the beginning of the 21st century, there are a number of figures such as Michael Rothberg (**2009**), Aamir Mufti (**2007**), Maxim Silverman and Griselda Pollock (**2014**), who bring together antisemitism and racism in their work, looking at the intertwined histories of colonialism and the Holocaust in particular, rather than treating them as separate spheres. In other words, they are retrieving an anti-colonial tradition up until the 1960s.

RV: What about antisemitism and Islamophobia, so-called 'good' and 'bad' Jews or Muslims?

BC: I may have to harden my skin a little bit, but I would like to write a *Comment is Free* article about the way that racial discourse works in general in liberal culture. Similar processes are used to integrate minorities, to manage and control 'good' and 'bad' women, and to differentiate 'good' from 'bad' citizens in general. This discourse is so prevalent because it is promoted by successive governments in the name of integration into the liberal state. Jews historically experienced these processes which divided them up into good and bad, with 'good' Jews learning that they were made 'good' by the family, the community, entrepreneurship, professionalisation, suburbanisation. 'Bad' Jews, on the other hand, tended to be unassimilated, in a lower class, and lived together in inner city ghettos or enclaves. They spoke their own mother tongues instead of the national language, English, and could be rather too religious. State agencies often explicitly categorised them as 'bad', as did the Anglo-Jewish establishment and the law courts, as Didi Herman has shown (**2011**). If you look at case law throughout the 20th century, judges would sit there and would ask questions about where you live, where you were born; they would look at how you dressed, how you spoke, what schools your children went to. This is how you were judged in relation to liberal culture. So, the important point, the really important point, is that racial discourse and sexist discourse is mainstream, it's not extreme, it's not on the margins. To be sure, you'll find a lot of illiberal discourse obviously in social media. Before social media, you would have found a lot of illiberal discourse in private letters or diaries or in mass observation interviews, which was the Twitter or Facebook of the time. But, within a liberal culture, in relation to liberal so-called 'tolerance', it's the division into good and bad types that counts.

Now that's historically how Jews and women are categorised; today Muslims are very much categorised in similar terms, and there is a lot of literature on the 'good' Muslim in relation to the 'bad' Muslim. Just as Jews were also communists and Bolsheviks and anarchists and terrorists, the 'bad' Muslim is categorised in similar terms as beyond the pale. The 'good' Muslim is also about community, integration, religion – not too much but just enough religious practice, so that it remains mainly a private matter. So, the discourse hasn't changed that much. And this is why I bring together racism and antisemitism as mainstream discourses. And one of the reasons I would argue that the Labour party has got itself into such trouble is that it has incorporated these mainstream discourses and divided Jews up into good and bad. They're 'good' if they're good socialists, they support Corbyn, they are actively pro-Palestinian, and they don't have too much to do with the mainstream Jewish community.

They're 'bad' if they are part of the established community which is more conservative, with a small 'c'. There is of course an illiberal tradition of racialising Jews that is out there, but it seems to me that the focus in the first instance should be on the mainstream. This isn't about socialism or a specific left-wing tradition of antisemitism. My position is that antisemitism and Islamophobia, not to mention sexism, in the two main political parties is about the way that racial and sexual discourses work in general within liberal culture.

HT: What do you mean by supersessionist thinking? And what would be an alternative framework?

BC: I see that you are putting me on my hobby horse. My 2017 article referred to supersessionist thinking in relation to the anxiety of a host of new disciplines with regard to a supposedly older Jewish and Holocaust studies. Supersessionist thinking is a very old idea, and it can be traced back to replacement theology, which claims Christianity as a religion has superseded – or replaced – Judaism. According to this logic, the Christian version of the New and Old Testament is seen as the story of the New Testament superseding the Old. But there are many different kinds of Christian supersessionism. In short, you can have complete replacement – the new replacing the old – or you can have economic or fulfilment forms of supersessionism which many Christian theologians promote today. The use of 'economic' here is a bit like being economical with the truth. So, it is the tension between the new and the old which is of interest.

I apply supersessionist thinking in a secular sphere in terms of Jewish history being superseded or replaced by newer histories. If we look at diaspora studies, for instance, we find Robin Cohen's *Global Diasporas: An Introduction* (**2008**), where the transcendence of the 'classic' Jewish diaspora is announced in the first chapter. Ghetto studies raise similar issues. If we think of the ghetto today it tends to be reduced to the African-American experience. Rather than acknowledging the rich social and cultural history of words such as 'diaspora' and 'ghetto', these tend to be reduced to separate spheres or forms of identity politics. If an older history is superseded by a newer history then there is a refusal to engage with plural or multiple histories of, in my examples, diaspora or ghetto. Antisemitism is sometimes regarded as a history that is confined to the past, to the Second World War, whereas racism or Islamophobia now applies to the present. But any visit to the great European capital cities will find intersecting histories of antisemitism overlain with anti-Black racism, Islamophobia, and anti-Roma racism. That is the problem with disciplinarity, new disciplines replacing old disciplines, as it leads to new histories replacing supposedly old histories rather than intersecting with

them. What does it mean when Cohen's *Global Diasporas* constructs the Jewish diaspora as 'classical'? My argument is that it makes this form of diaspora foundational whose only function is to be transcended by more contemporary diasporas. The same applies to ghettos: you can think about the Venetian ghetto as the founding ghetto that has been replaced by newer ways of conceiving the ghetto. So supersessionist thinking leads to foundational thinking. Both are reductive and binary. Foundational thinking also inflects the placing of the Holocaust in the West at the centre of our understanding of victimhood. In a critique of this approach, I follow Stef Craps (**2013**) who wants to decentre the history of the Holocaust, and I would agree with that. You can think about the Holocaust, for instance, in terms of wider histories – imperialism and colonialism in particular, as Mark Mazower has shown in his *Hitler's Empire* (**2009 [2008]**). One of the problems of thinking about the Holocaust foundationally is that it becomes an exceptional history that is fixed in the past and is uniquely unique.

What is an alternative framework? In general, we are in a period where we are looking for a vocabulary to try and name new phenomena. Postcolonialism, postmodernism, and poststructuralism are pretty exhausted terms. My approach is broadly intersectional, on the side of multiplicity, plurality, and multidirectionality.

HT: We are in the 'trans' era now, aren't we?

BC: Exactly. This applies to sexuality more than anything else, certainly when it comes to my students' generation, but also to history and politics. We are in a period of interregnum; as Antonio Gramsci famously stated, 'the old is dying and the new cannot be born' (**1971: 276**). I agree that we are in a 'trans' era precisely because, as Gramsci maintains, the old/new binary no longer works. We might yearn for an easy supersessionism but that model is defunct. What we need, instead, are new forms of comparativism that change each part that is compared. As you know, I have been engaging with the work of Zygmunt Bauman for some time now. He was constantly in search of a new vocabulary to make sense of the changing times. His late move from 'solid' to 'liquid' modernity is particularly interesting. He thought of the contemporary period in relation to liquidity or fluidity, which includes the difficulty of naming and the difficulty of being fixed or certain about your identity. And I think we need to recognise that. But next to such fluidity is our interconnected world and this obviously feeds into some of the most pressing issues of present times, such as global warming. So, my position is that we have both interconnection and fluidity, which moves us away from fixed histories, identity politics, and national ways of thinking. But I have to recognise that the last vestiges of nationalism, which we are

experiencing currently, indicate that the old is taking a really long time to die and the new is having a difficult birth, to say the least.

RV: What are the potentials and limitations of interdisciplinarity in this context? What do you mean by 'ill-discipline'?

BC: Ill-discipline was a term that I used in the introduction to the special issue of the journal *Wasafiri* (**2009**) that I edited. I went back to Hannah Arendt's idea of 'thinking without a banister' (qtd. in Bernstein, **1996: 41**) or preconceived categories. Edward Said had a similar position when he characterised the intellectual as an 'amateur' rather than a 'professional' (**1994: 49–62**). By this he meant that thinkers should stand outside of institutions and speak in a language that is understood generally rather than by a specialised group of professionals. To be ill-disciplined means that you are interested in questions, not answers, and that you stand outside of disciplinary boundaries.

I think there is a tremendous potential in relation to interdisciplinarity, going beyond and outside disciplines. Being ill-disciplined means that we can have a richer sense of historical, political, and social connectedness – a richer sense of human connectedness – if we look beyond our own orthodoxies. Universities tend to speak the speech of interdisciplinarity and do very little in practice about it. The best model that I have experienced is in the United States where you have programmes that enable you to teach a particular subject across disciplines. From women studies to ghetto studies, to diaspora and minority studies, for example. But in the UK system such programmes are not funded. You are only acknowledged by the teaching you do within a particular department, or a particular school. So, I believe that there is a conflict between institutional thinking and Said's characterisation of the ideal intellectual. The future has to be outside of disciplines. Too many academics know more and more about less and less, which means that it is difficult to range across subjects, histories, and cultures. But that seems to me to be the only way forward in our increasingly globalised and, sadly, nationalist world.

HT: Speaking about 'thinking without a banister', can you elaborate on the ghetto and diaspora as travelling concepts? They both seem to build on the idea of borders, containment, and limitations, right?

BC: Yes. Well, both of these terms are multi-layered and Janus-faced. Diaspora points in two different directions as follows. I agree one direction is about borders and limits, moving from the periphery back to the centre where you belong, or where you are supposed to belong. Diaspora in that narrative is deeply conservative, with a small 'c', and reinforces the idea of a pure national culture. It mistakenly assumes that

people belong to certain places and not to other places. But there is a second version of diaspora which is transgressive; concerned with border-crossing, it undermines national cultures and is on the side of emergent or 'trans' identities. This version of diaspora reinforces all kinds of intertwinings, interconnections, and mixings. So, diaspora travels in two different directions.

Ghetto, historically, is not wholly a negative term and can lead to different forms of cultural flourishing – by men and by women, in science, literature, and theology – from the Harlem renaissance back to Venetian culture coming from Europe and North Africa. The ghetto of course can be a form of racial and urban segregation, on the side of deprivation and even genocide. But, historically, from the earliest ghettos to contemporary North America, the ghetto is also on the side of modernity – urban development, professionalisation, the growth of the state. The truth is that at any one time different versions of diaspora and the ghetto co-exist. The reason the concepts travel is that they have many different possible meanings that those who live these concept-experiences hold on to at any one time.

RV: To what extent is cosmopolitanism a useful concept?

BC: Cosmopolitanism is surprisingly still quite troubling, especially within postcolonial studies and especially here at Warwick. So, you have one version of postcolonial studies which essentially is a form of Marxian thinking which argues that the only real progressive form of postcolonialism is in relation to national cultures. After all, it was the nation that led to the overthrow of colonialism and can also, in its most benign form, liberate the wretched of the earth. This form of postcolonialism argues that you need a politics of national anti-colonialism to overthrow colonial power. It is uncannily related to Corbyn's intermittent left-wing Brexiteering where he thinks we'll be able to get socialism on our little island. So, within that version of postcolonialism, the figure of the cosmopolitanism is actually quite threatening. By extension, the diasporic transgressor or the hybrid or the boundary-crosser – figures who deny and question national boundaries – threaten the 'many not the few' politics of national anti-colonialism. For that reason, there is a strand within this version of postcolonialism that denigrates cosmopolitans, including Edward Said, who is dismissed as a humanist, or Salman Rushdie, who is dismissed as a mere individualist, or other cosmopolitan figures who are exiles and who don't see themselves as located within any one national culture. In this argument there is a 'good' and a 'bad' Said. As the proponent of a Palestinian national homeland he was, of course, fine. But as a humanist, even a global humanist, he was suspect. So, the cosmopolitan figure is surprisingly

threatening. This may be another reason why contemporary postcolonial studies is so ill-at-ease with the Jewish experience of crossing boundaries and focuses instead on the national solution to the Jewish question.

HT: Is it possible to avoid the reiteration of centre/margin, north/south, east/west in postcolonial studies?

BC: All I would say is national anti-colonialism reinforces these binaries. It's not straightforward, however, as colonialism *was* overthrown by nationalism. There is obviously a whole range of nationalisms, although progressive or socialist forms of nationalism have tended to be eroded over the years and turned into ethno-nationalisms as we can see in the examples of India and Israel. So, it certainly seems to me incumbent to challenge these various binaries while holding on to fundamental ways of thinking about the global poor, the underdeveloped world compared to the overdeveloped world, and the damage to the planet caused by global warming.

HT: And these binaries have been blurred, right? I'm thinking of the Portuguese brain drain to Angola, for example, where a traditionally Global North country loses its workforce to an African country.

BC: Yes, I agree with that absolutely. The influence of China also is key – especially in Africa, increasingly in India – and undercuts many conventional ways of thinking. This is state-controlled capitalism on a global scale, often intervening in the poorest regions as the USSR did during the Cold War. So, whilst we should not move away from the wealth divisions in the world, it is getting harder to divide the world up neatly. China will complicate the picture immeasurably in the next decade or so.

HT: We've already almost established that we're in the 'trans' phase. What does the term 'postcolonial' – postcolonial criticism, postcolonial theory – then still have to offer?

BC: This is a good question. I teach a contemporary literature course at Reading, and we always start with Salmon Rushdie. But we start with Rushdie as a foundational text. We ask the question, where does the contemporary come from? The contemporary is another one of these words that is Janus-faced. Historically, what 'contemporary' means is something that happens *at the same time*. It was only about the 'now' and the 'new' from 1972 onwards, about the same time that postmodernism came into being. And, following the demise of postmodernism, postcolonialism, as I said earlier, has also become quite exhausted and has been expanded into a more planetary concept. Just as postcolonial literature has moved into world literature, postcolonial studies is now an aspect of global studies. The problem with postcolonial

studies is that it never really detached itself from regional studies. And my experience as a university teacher is that younger people want to think about the world as a whole, not just in terms of regions, even though some regions are more privileged than others.

We are all rightly thinking in terms of decolonisation rather than postcolonisation. This opens up so many vistas such as the project to decolonise the Frankfurt School. At the Bauman Institute, at the University of Leeds, we have been talking about decolonising Zygmunt Bauman's work, which he did himself to some extent. And that has been really productive. I like the idea of decolonising the university curriculum as well, which has had an impact on my English Literature department. But decolonisation can be misunderstood historically. We have to acknowledge our colonial history rather than expunge it. As Walter Benjamin said famously, 'There is no document of civilization which is not at the same time a document of barbarism' (**1969: 256**). And I believe that it's very naïve to think that we can somehow supersede our colonial past as if it isn't also part of our present 'civilisation'. We are a product of colonialism – our culture, our houses, our universities, our financial institutions. I do not believe that *Rhodes Must Fall* but that Rhodes should stand for our colonial present and be acknowledged as a central part of our history and of the history of some of our most important institutions. I guess my position is that 'decolonisation' or anti-racism or anti-sexism are not quick fixes, as the issues they address are so deeply engrained in our culture. They can only be promoted effectively by teachers, professors, and thinking activists if we understand that it will take a long process of dialogue and education to rid ourselves of their pernicious effects.

RV: What is the role of activism in academia, if indeed there is one? How can we get away from moralising politics? What can academia do to intervene, with populism on the rise?

BC: Yes, this is a question I touched upon in my article 'Against Supersessionist Thinking' (**2017**), which got me into trouble. I remain critical of certain forms of unthinking activism and have been quite public about that and have intervened in various public seminars. That is why my starting point is Adorno's phrase 'thinking activism', which brings activism and thought together. Nuanced, complex thinking has to go together with activism or what is the point of being an academic or intellectual?

The phrase 'clickbait' comes to mind. So essentially, we're all too quick on social media to respond in an unnuanced and binary way. And the most common form of binarism is of course a form of moralism, dividing the world up into good and bad. Now what the world needs, and what

we all need to engage in, is more dialogue, not less. We need to be speaking to each other, not dehumanising the other. We need to be hearing each other, not shouting each other down. We need to be speaking across orthodoxies, across borders, across identities. We need to be listening and thinking more than we are. And the problem with moralising the world is that you simply stop listening to the other and the other becomes actually something, *someone*, a human being, that you can't listen to. They are put in a category that lessens their humanity. I categorise such moralism as unthinking activism as it divides the world up much too neatly into good and bad. There are fascists, or Nazis, on the one hand, and victims and survivors on the other. Social media obviously reinforces all of that. But what this means is that we only ever speak to the 'good', we only ever speak to a certain circle of people within our own goodness bubble, and we reject other human beings as beyond the pale. Thinking activists surely have to change this model of engagement.

Now I have been challenged by activists who say, 'But I am good, my politics are good. I believe in socialism. I believe in helping the poorest, the weakest. So, my politics *are good*'. But I think the problem is, and this is something that Bauman argued, that if you stop thinking about socialism, and say that your position is and always will be a socialist position, at that point you cease to be a socialist. Bauman, of course, lived through Stalinism. So, we need, it seems to me, to be constantly thinking, constantly questioning, constantly in dialogue with others – most importantly the people that we purport to help – because that is the only way we can bring about lasting change. The problem with categorising yourself as good is that immediately others are categorised as bad and are deemed beyond the pale. That is why moralisation remains a problem, as thought ceases the moment one moralises. As academics and intellectuals, the one skill we have is to think critically, and to talk to others, to be in dialogue with others. And that, it seems to me, is what Adorno meant by *thinking* activism, and it's that kind of activism, which combines nuance, complexity, *thought*, with action, that counts.

HT: Just a side note, but I was just thinking we're also teachers, right? So, there's a lot of space to problematise the neat categories that are out there and the vocabulary that is out there. I think this is one of the tasks that we face. Is that also perhaps where our activist potential is located?

BC: I could not agree more with this statement. Everything that I have said to you in this interview is something that I would say in the seminar room or lecture theatre. Influencing our students, our colleagues, our friends and relatives is certainly an important form of activism. We

encourage nuanced thought and complex argument and all forms of critical engagement so how can we abandon these hard-won humanising virtues in the name of an *unthinking* activism?

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The Frankfurt Memory Studies Platform (FMSP) is an initiative of the Forschungszentrum für Historische Geisteswissenschaften (FzHG) at Goethe University Frankfurt. Founded by Astrid Erll (Department of English and American Studies), the FMSP brings together people and projects from history, sociology, literature, arts, media studies, psychology, and other relevant disciplines to foster dialogue about memory. It aims to shape the future of memory studies by developing and discussing new research questions and new methodologies. The activities of the FMSP revolve around three main research areas: transcultural memory, the mediality of memory, and memory and narrative.

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References

Bal, M., 2002. *Travelling Concepts in the Humanities: A Rough Guide*. Toronto, Canada: Toronto University Press.

Bauman, Z., 1991. *Modernity and Ambivalence*. Cambridge: Polity Press.

Bauman, Z., 2000. *Liquid Modernity*. Cambridge: Polity Press.

Benjamin, W., 1969. *Illuminations: Essays and Reflections*. Ed. by Zohn, H. New York: Schocken Books.

Bernstein, R. J., 1996. *Hannah Arendt and the Jewish Question*. Oxford: Polity.

Bhabha, H., 1983. 'The Other Question: Stereotype and Colonial Discourse', *Screen*, 24 (November–December), 18–36. Available at: https://doi.org/10.1093/screen/24.6.18 [Accessed: 9 September 2019].

Césaire, A., 2000 [1972]. *Discourse on Colonialism*. Trans. by Pinkham, J. New York: Monthly Review Press.

Cheyette, B., 1999. 'The Ethical Uncertainty of Prima Levi', *Judaism: A Quarterly Journal of Jewish Life and Thought*, 48 (1), 57–67.

Cheyette, B., 2009. 'Jewish/Postcolonial Diasporas: On Being Ill-disciplined', *Wasafiri*, 24 (1), 1–2. Available at: https://doi.org/10.1080/02690050802588950 [Accessed: 9 September 2019].

Cheyette, B., 2014. *Diasporas of the Mind: Jewish and Postcolonial Writing and the Nightmare of History*. Yale: Yale University Press.

Cheyette, B., 2017. 'Supersessionist Thinking: Old and New, Jews and Postcolonialism, the Ghetto and Diaspora', *Cambridge Journal of Postcolonial Literary Inquiry*, 4 (3), 424–439. Available at: https://doi.org/10.1017/pli.2017.31 [Accessed: 9 September 2019].

Cheyette, B., 2018a. '"Enthusiast": A Response to the Responses', *Cambridge Journal of Postcolonial Literary Inquiry*, 5 (1), 129–133. Available at: https://doi.org/10.1017/pli.2017.48 [Accessed: 9 September 2019].

Cheyette, B., 2018b. 'Postcolonialism and the Study of Anti-Semitism', *The American Historical Review*, 123 (4), 1234–1245. Available at: https://doi.org/10.1093/ahr/rhy028 [Accessed: 9 September 2019].

Cheyette, B., 2020. *A Very Short Introduction to the Ghetto*. Oxford: Oxford University Press.

Clifford, J., 1986. 'Partial Truths'. *In:* Clifford, J. and Marcus, G. E., eds., *Writing Culture: The Poetics and Politics of Ethnography*. Berkeley, CA: University of California Press, pp. 1–26.

Clifford, J., 1992. 'Traveling Cultures'. *In:* Grossberg, L., Nelson, C. and Treichler, Paul A., eds., *Cultural Studies*. New York: Routledge, pp. 96–116.

Cohen, R., 2008. *Global Diasporas: An Introduction*. 2nd edn. London: Routledge.

Craps, S., 2013. *Postcolonial Witnessing: Trauma Out of Bounds*. New York: Palgrave Macmillan.

Delbo, C., 2001 [1990]. *Days and Memory*. Trans. and with a preface by Lamont, R. Evanston, III.: Marlboro Press/Northwestern.

Erll, Astrid, 2011. 'Travelling Memory', *Parallax*, 17 (4), 4–18. Available at: https://doi.org/10.1080/13534645.2011.605570 [Accessed: 9 September 2019].

Fanon, F., 2017 [1967]). *Black Skin, White Masks*. New edn. Intro by Gilroy, P. Trans. by Markmann, C. L. London: Pluto Press.

Freitas, V., 2018. 'Writing in Inclement Weather: The Dialectics of Comparing Minority Experiences in Threatening Environments', *Cambridge Journal of Postcolonial Literary Inquiry*, 5 (1), 106–114. Available at: https://doi.org/10.1017/pli.2017.47 [Accessed: 9 September 2019].

Gilroy, P., 1993. *The Black Atlantic: Modernity and Double Consciousness*. Cambridge, Mass: Harvard University Press.

Gilroy, P., 2004. *Between Camps: Nations, Cultures and the Allure of Race*. 2nd edn. London: Routledge.

Goetschel, W., and Quayson, A., 2016. 'Introduction: Jewish Studies and Postcolonialism', *The Cambridge Journal of Postcolonial Literary Inquiry*, 3 (1), 1–9. Available at: https://doi.org/10.1017/pli.2015.35 [Accessed: 9 September 2019].

Gramsci, A., 1971. *Selections from the Prison Notebooks*. Ed. and trans. by Hoare, Q. and Nowell-Smith, G. London: Lawrence & Wishart.

Herman, D., (2011). *An Unfortunate Coincidence: Jews, Jewishness, and English Law*. Oxford: Oxford University Press.

Levi, P., 2013 [1986]. *The Drowned and the Saved*. Trans. by Rosenthal, R. London: Abacus.

Mazower, M., 2009 [2008]. *Hitler's Empire: Nazi Rule in Occupied Europe*. London: Penguin.

McLeod, J., 2018. 'Figuring and Transfiguring: A Response to Bryan Cheyette', *Cambridge Journal of Postcolonial Literary Inquiry*, 5 (1), 90–97. Available at: https://doi.org/10.1017/pli.2017.46 [Accessed: 9 September 2019].

Mufti, A., 2007. *Enlightenment in the Colony: the Jewish question and the Crisis of Postcolonial Culture*. Princeton, N.J.; Oxford: Princeton University Press.

Pollock, G. and Silverman M., 2014. *Conentrationary Memories: Totalitarian Terror and Cultural Resistance*. London; New York: I.B. Tauris.

Robins, S., 2018. 'Thinking Through and Beyond "Competitive Memory" and Hierarchies of Suffering', *Cambridge Journal of Postcolonial Literary Inquiry*, 5 (1), 98–105. Available at: https://doi.org/10.1017/pli.2017.43 [Accessed 9 September 2019].

Roca Lizarazu, M., and Vince, R., 2018. 'Memory Studies Goes Planetary: An Interview with Stef Craps'. *Exchanges: The Interdisciplinary Research Journal*, 5 (2), 1–15. Available at: https://doi.org/10.31273/eirj.v5i2.245 [Accessed 9 September 2019].

Roemer, N., 2018. 'On Cheyette: "Against Supersessionist Thinking: Old and New, Jews and Postcolonialism, the Ghetto and Diaspora"', *Cambridge Journal of Postcolonial Literary Inquiry*, 5 (1), 123–128. Available at: https://doi.org/10.1017/pli.2017.42 [Accessed 9 September 2019].

Rothberg, M., 2009. *Multidirectional Memory: Remembering the Holocaust in the Age of Decolonization*. Stanford, Calif.: Stanford University Press.

Rothberg, M., 2018. 'For Activist Thought: A Response to Bryan Cheyette', *Cambridge Journal of Postcolonial Literary Inquiry*, 5 (1), 115–122. Available at: https://doi.org/10.1017/pli.2017.37 [Accessed 9 September 2019].

Said, E., 1994. *Representations of the Intellectual: The 1993 Reith Lectures*. New York: Vintage.

Said, E., 2003 [1978]. *Orientalism*. London: Penguin Books.

Sartre, J-P., 1995 [1948]. *Anti-Semite and Jew*. Trans. by Becker, G. J. New York: Schocken Books.

Semprún, J., 1997. *Literature or Life*. Trans. by Coverdale, L. New York: Viking.

Spivak, G. C., 1988. 'Can the Subaltern Speak?'. *In:* Grossberg, L. and Nelson, C., eds., *Marxism and the Interpretation of Culture*. Urbana: University of Illinois Press; Basingstoke: Macmillan, pp. 271–313.

Young, R. J. C., 1995. *Colonial Desire: Hybridity in Theory, Culture and Race*. London: Routledge.

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