PSYCHOLINGUISTIC ASPECTS OF THE DEVELOPMENT OF STUDENTS' CRITICAL APPROACH TO THE SOLUTION OF TERMINOLOGICAL PROBLEMS IN ONLINE TRANSLATION LEARNING

Leonid Chernovaty

http://orcid.org/0000-0003-3411-9408

Scopus Author ID: 57217131223

leonid.m.chernovaty@meta.ua

V. N. Karazin Kharkiv National University, Ukraine

Natalia Kovalchuk

http://orcid.org/0000-0002-9483-4297

kovalnatalya@bigmir.net

V. N. Karazin Kharkiv National University, Ukraine

Abstract. The research is aimed at exploring the approaches to increase the efficiency of the development of the future translators' critical approach to the solution of terminological problems, as well as the specialized bilingual (English and Ukrainian) terminology acquisition, in online teaching and learning. The method of research is based on the assumption that the said increase can be achieved through the intensification of the students' analytical and thinking activity in their independent work by means of post-editing the machine-translated target texts combined with the simultaneous written explanation of the reasons for the respective corrections. This assumption was tested in the pilot experimental online teaching of specialised (in the domain of Psychology) translation to the first-year MA students majoring in Translation. The participants' performance assessment took into account the amount of the independent work done by them, the level of their critical approach, as well as the specialised terminology usage accuracy in the final translation test. The results of the analysis proved the apparent dependence of the participants' critical approach to the solution of terminological problems and the efficiency of specialised terminology acquisition on the intensity of their analytical and thinking activity in their independent work. The advantage of the participants with the highest level of the said intensity over those with the average one amounted to 16%, and 40% – over those with the lowest intensity. The efficiency of the development of students' critical approach to the solution of terminological problems and the specialised terminology acquisition in online translation teaching and learning may be increased by intensification of their analytical and thinking activity in the process of meaningful post-editing of machine-translated target texts.

Keywords: online teaching, critical approach, machine translation, analytical and thinking activity, post-editing, decision-making, problem solution, specialised translation, terminology.

Черноватий Леонід, Ковальчук Наталя. Психологічні аспекти розвитку критичного ставлення студентів до розв'язанням термінологічних проблем у дистанційному навчанні перекладу.

Метою роботи є пошук шляхів підвищення ефективності формування критичного ставлення до розв'язання термінологічних проблем і засвоєння двомовної (англійської та української) вузькоспеціальної термінології у дистанційному навчанні майбутніх перекладачів.

Методика дослідження виходила з припущення, що згаданого підвищення ефективності в дистанційному навчанні можна досягти шляхом активізації мисленнєво-аналітичної діяльності студентів під час самостійної роботи за рахунок виконання завдань з пост-редагування текстів, перекладених за допомогою машинного перекладу, з одночасним письмовим поясненням причин відповідних виправлень. Це припущення перевірялося впродовж пілотного експериментального дистанційного навчання спеціалізованого перекладу в галузі психології за участі студентів рівня магістра (спеціалізація «Переклад»). Оцінювання роботи студентів здійснювалося за такими критеріями як обсяг виконаних самостійних завдань, ступінь неформальності їх виконання, а також правильність вживання спеціалізованої термінології у підсумковій контрольній роботі. Результати аналізу засвідчили очевидну залежність сформованості критичного ставлення випробуваних до розв'язання термінологічних проблем і ефективності засвоєння спеціальної термінології від інтенсивності мисленнєво-аналітичної діяльності випробуваних під час самостійної роботи. Перевага випробуваних з найвищим рівнем згаданої інтенсивності склала 16% над випробуваними середнього рівня і 40% – над випробуваними з низьким його рівнем. Ефективність формування критичного ставлення до розв'язання термінологічних проблем у процесі перекладу, а також засвоєння спеціальної термінології у дистанційному навчанні можна підвищити за рахунок інтенсифікації мисленнєво-аналітичної активності студентів в процесі осмисленого пост-редагування текстів, перекладених машиною.

Ключові слова: дистанційне навчання, критичний підхід, машинний переклад, мисленнєво-аналітична діяльність, пост-редагування, прийняття рішень, розв'язання проблем, спеціалізований переклад, термінологія.

Introduction

The issue of the critical approach to the solution of terminological problems in translation is closely related to its process, which has been studied for decades. Many authors have been engaged in its research, for example, Wolfgang Lörscher has been doing it since the early 1980s (Lörscher, 2008). The psychologists and psycholinguists have been active as well, which is reflected, among other works, in the collective monograph (Schwieter & Ferreira, 2017), whose issues range from the relationship of translation and cognition in general, its theoretical perspectives, methodological innovations, workplace characteristics, competences, training and interpreting to outlining evolution, problems and prospects of research into the cognitive aspects of translation. Of particular interest, among other contributions, are the review of translation process research in general (Jakobsen, 2017) and the retrospective overview of its models from the late 1949s to the beginning of the new millenium (Carl & Schaeffer, 2017).

In its most general meaning, translation may be regarded as the process of decision-making and solution of problems (Englund Dimitrova, 2010; Nord, 2016), including terminological ones. This process is based on the combination of automatized and conscious operations. According to the research (Lörscher, 2008), experienced translators solve their problems on the basis of the intricate neural network, which provide for the optimal selection of the proper variant of such solution from a range of available options through the critical analysis of the context. The said network is gradually developed as the result of a considerable amount of translation activity in the course of doing appropriate tasks in the process of formal learning and/or beyond it. Because the translation problems may be classified into types, which the learner

inevitably comes across within the same text, as well as within other texts, the neural configurations, which serve as the basis for the solution of the specific types of problems, gradually develop in the learner's mind. On the other hand, in most cases, the said problems may fall into subtypes and thus there may be more than one way to solve the monotypical problems. Therefore, in the process of translation practice, the said neural configurations get more intricate, developing into ever more complicated network, which is the basis of the individual's professional activity. The degree of the said network intricateness, and thus the efficiency of translation problems solution, depends, among other factors, on the amount of translation practice and the intensity of the learners' thinking and analytical activity in their independent work, the bulk of which falls on their independent work.

Thus, in the most general sense, we may assume that the development of the translator's competence in general and the critical approach to the terminological problems solution in particular, requires a proper intensity of the learners' thinking and analytical activity in their independent work. However, in the online learning, which became extremely widespread because of the COVID-19 restrictions, meeting this seemingly simple requirement ran into serious problems.

In the course of their independent work, the students acquired an ability to immediately translate any text by means of MT engines by just touching a button, while the teachers lost any control over the development of their students' translation competence. It caused unprecedented euphoria among students and unparalleled confusion among teachers. The latter clearly realized that as the result of this MT revolution, neither the amount of the students' translation practice nor the intensity of their thinking and analytical activity met the requirements. Moreover, in the course of such 'activity' the students' mind remained passive, which resulted in the fact that the development of the said neural network just did not happen.

It is worth mentioning that there are conflicting opinions concerning the MT application in teaching future transltors. In some authors' view (Pym, 2013), the new systems of neural MT (see, e.g., O'Brien et al., 2020) may eventually oust human translators, at least in some domains. Thus, it is suggested (Pym, 2013; Mellinger, 2017) to fundamentally change the content of teaching future translators by introducing MT into all appropriate disciplines of the curriculum. However, not all authors share this view (see, e.g. Esqueda, 2021). In addition, some studies (Moorkens, 2018) on the comparative efficiency of neural and statistical MT systems cast some doubt concerning the undisputed advantage of the former.

In any case, in practice, the online transition and the negative (in the teachers' view) students' MP experience displayed the problems within traditional approaches to translator training and teaching in the new circumstances. It may partially be explained by suddenness of the said transition, which caught the teachers unprepared (see, e.g., Wu & Wei, 2021).

Some authors cherished hopes that post-editing might be the answer; it was expected to compensate for the loss in the intensity of the students' thinking and analytical activity. Generally, there are conflicting opinions concerning the post-editing efficiency. One research (Yang et al., 2021) established its significant advantage over human translation while another one (Lee, 2018), on the contrary, found it to be

inefficient, which made the author to be skeptical about the necessity to waste time for the development of students' post-editing skills, calling to take care of their basic translator competence instead. In any case, the high hopes some authors entertained concerning the role of post-editing as a compensatory mechanism, seldom come true. Most students (at best) usually limit themselves to symbolic editing without even getting close to the desired level of thinking and analytical intensity.

The attempts to officially prohibit the MT application in the students' independent work usually do not succeed either as they possess a wide range of means to overcome it, which the teachers have neither time nor desire to look for.

Thus, to provide for the full-fledged development of the future translators' competence, specifically of their critical approach to the solution of terminological problems, it is necessary to look for the ways to boost the students' thinking and analytical activity, which would take into account the specifics of the online learning and teaching – and that was the aim of our research. To achieve this aim, we had to work out the appropriate methodology and verify its efficiency in a pilot experiment. The fulfillment of those tasks is described in the following sections.

Methodology

Bearing in mind the said aim, the hypothetical teaching procedure had to take into account two factors: (1) because the complete ban on MT application in the online learning and teaching turned out to be ineffective, it had to be allowed, but we had to find the ways of its transformation into a productive learning and teaching tool; (2) the possible means of the said transformation could be the post-editing of the machine-translated text but only on condition the students edit it thoroughly, which theoretically could provide for the required intensity of their thinking and analytical activity.

As an instrument to provide for the said thoroughness, we chose the introspective research procedure 'Think Aloud Protocol' (TAP) adapted for the needs of written translation. This procedure has been successfully employed in the translation process research, for example, to study decision-making, creative thinking and attitude toward the task (Kussmaul & Tirkkonen-Condit, 1995), as well as the linguistic (Künzli, 2009) and cognitive (Cifuentes-Ferez et al., 2015) aspects of translation.

TAP is mostly used to study interpreting when the subjects analyse their own deliberation process verbalizing their decision-making in dealing with a translation problem. Those deliberations are recorded and then analysed. Because, in our case, we studied the written translation process, the TAP procedure was adapted according to the aim of our research. It had the form of a verbal written commentary provided immediately after a specific fragment (usually a sentence) of the MT target text (MT TT) had been edited. That is, the students translated the specific English text into Ukrainian by means of the MT (*Google Translate*) engine, and then they post-edited it providing a detailed written commentary with the explanation of the reasons for each correction made in the MT TT. It was assumed that this manner of post-editing in combination with the said commentaries would provide for the sufficient intensity of the students' thinking and analytical activity contributing to the development of relevant neural network in ther mind. In its turn, it was expected to positively affect the development of their general

translator competence, including the critical approach to the solution of terminological problems, even in translating without MT application.

Basing on these assumptions, we formulated the following hypothesis of our research.

In online translation teaching, the efficiency of the development of critical approach to the solution of terminological problems in translation, as well as of the specialized bilingual (English and Ukrainian) terminology acquisition, may be increased by means of intensifying the students' thinking and analytical activity in their independent work. The said intensification may be provided for by post-editing machine-translated texts in combination with detailed verbal written explanations of all corrections made in the MT TT,

The testing of this hypothesis was carried out in a pilot experiment with a duration of 38 academic hours (8 contact hours and 30 hours of independent work). The experiment dealt with online teaching specialised translation in the domain of Psychology, specifically oriented toward the acquisition of appropriate psychological terminology.

The said teaching involved 21 participants, first-year MA students majoring in English and Translation at V. N. Karazin National University of Kharkiv (Ukraine). Their command of General English corresponded to level C1 in the CEFR classification (CEFR, 2018). The students also had had some experience in translation in social-political and some other domains. The participants had instrumental motivation as the results of their learning were taken into account in assessing their progress within the semester.

The 80-minute weekly online contact classes involved the work with appropriately oriented English texts that included preparatory exercises (acquaintance with the new English terminology and its Ukrainian equivalents in parallel texts, consolidation of associations between the equivalents at the word and collocation levels, etc.), as well as translation tasks at the passage and text levels. For the sake of time economy, all tasks within contact classes were completed orally.

The independent work tasks, however, were all done in writing according to the procedure described above. The post-edited machine- translated texts together with the detailed commentary concerning the reasons for the corrections were weekly sent to the teachers who analysed them and assessed according to a number of criteria. The teachers took into account the amount of reasonable corrections made by the participants and the persuasiveness of their argumentation. Those criteria were assumed to be the indicators of the intensity of the participants' thinking and analytical activity.

Following the analysis of a specific participant's work, the latter was assigned to one of the four levels: level A – non-formal post-editing, grounded corrections, convincing argumentation; level B – mainly non-formal post-editing, mostly acceptable corrections, sporadic lack of convincing argumentation; level C – largely formal post-editing, insignificant amount of minor corrections, commonly deficient in convincing argumentation; level D – completely formal post-editing, exclusively minor corrections without convincing argumentation, omission of obvious errors in the MT TT.

For the sake of convenience, we developed an algorithm of converting the said levels into numeric values (10-point scale) taking into account the possible variations

within the same level. For example, the teachers assigned the value of 10 if they had no doubt that the specific work belonged to level A. If they had some doubts but ultimately gave preference to level A, they assigned it the mark of 9, but if they preferred level B, they gave it the mark of 8. Conversely, if, from the very beginning, they assigned it to level B – the specific work got the mark of 7. In a similar way, the marks were given within the lower levels (C or D).

Following the analysis of the students' works, the participants were arbitrarily subdivided into three groups – A (9–10 points), B (6–8 points) and C (below 6 points).

To establish the hypothetical impact of the intensity of students' analytical and thinking activity upon the development of their critical approach to the solution of terminological problems, the efficiency of specialized terminology acquisition and its use in the process of independent (without MT) translation, we conducted a special test at the end of our experiment. The participants were asked to translate the 248-word original text (see the Appendix) in 45 minutes. The text comprised 31 terms whose acquisition and use were controlled in the analysis.

Formally, the students were not allowed to use MT engines during the test, but there were no technical means to exclude this possibility, so the students' translations were assessed by comparing them with the MT TT on the basis of the 10-point scale (see above) to verify the degree of their independence (see table 1 further).

Results and Discussion

In this section, we present our results concerning the impact of the students' post-editing intensity in their weekly home tasks on the development of their critical approach to terminological problems, the efficiency of specialized terminology acquisition and its use in the process of independent (without MT) translation.

The analysis of the MT TT proved that the machine made 23 errors in translating the 31 terms controlled in the test, i.e. its terminological accuracy amounted to 26%. If our hypothesis is valid, we can expect the highest degree of literally coincidences with the MT TT among the subjects with the lowest thinking and analytical activity in their homework (group C), while the share of such coincidences in group A should be the least significant with the group B subjects' results somewhere in between. On the other hand, the efficiency of the specialized terminology acquisition and the accuracy of its use in the independent translation should be directly proportional to the said intensity, i.e. it should be highest in group A and lowest – in group C.

Following the test analysis, it was established that in cases when the machine suggested acceptable equivalents, the coincidences with the MT TT were observed in all groups, though there is a considerable variation concerning their shares. In group A, the coincidence rate ranged from 67% (terms 14 (*input devices – пристрої введення*) and 22 (*longitudinal studies – лонгітюдні дослідження*), to 56% (terms 6 (*processor – процесор*) and 24 (*subjects – випробувані*), while in other cases, it varied from zero to 33%. The same rate in group B amounted to 75% (term 21: *abstraction – абстракція*), 50% (terms 6, 8 (*transform – перетворювати*) and 24) and 0–25% regarding the remaining terms. In group C, the coincidence rate is much higher– from 28% (terms 21 and 24) to 43% (terms 8, 15 (*output – вихідні дані*) and 22), 72% (terms 6 and 13

(*information processing tasks – завдання з обробки інформації*) and 86% – terms 14, 24, 30 (*transcranial magnetic stimulations – транскраніальна магнітна стимуляція*) and 31 (*stochastic modelling – стохастичне моделювання*).

Thus, though the fact of the formal coincidence with the MT variant in each particular case cannot in itself be regarded as a convincing proof of MT use, the correlation of coincidence rates in different groups lets us assume a greater reliance on MT in group C. In its turn, it may be related to their less critical attitude to terminological problems, as well as the less effective acquisition of terminology because of insufficient intensity of their thinking and analytical activity.

This assumption is corroborated by the groups' coincidence rate in cases where the machine suggested unacceptable variants. In group A, the said share considerably decreases ranging from zero to 22%, while in group C it remains significant – from 100% (term 18: *thought – мислення*) to 86% (term 17: *perception – сприймання*), 72% (terms 3 (*computation – комп'ютеризація*), 2, 5, 9 and 20 (*mind – психіка*)), 57% (terms 1 (*cognitive science – когнітивна психологія*) and 10 (*mental representation – ментальна репрезентація*), etc. It is worth mentioning that the insufficient intensity of group C subjects' thinking and analytical activity affected their general ability to solve terminological problems. Even when they selected a variant different from the one suggested by the machine, it often was unacceptable. Thus, the terminological accuracy in this group was rather low.

The results of the analysis are presented in table 1.

Table 1
Terminological Accuracy and the Share of Coincidences with the MT Variants in the Test.

Group	HWI	TI	Average accuracy (%)			Average share of coincidences with MT (%)		
			general	MT (a)	MT (u)	general	MT (a)	MT (u)
A	9.6	7.5	70.7	87.9	63.0	21.2	31.5	15.5
B	7.0	4.8	50.8	77.3	46.6	33.6	36.4	22.5
C	1.7	1.6	46.1	85.9	22.7	52.9	83.2	49.1

Legend: HWI – degree of homework independence (out of 10); TI – degree of test independence (out of 10); MT (a) – MT acceptable variants; MT (u) – MT unacceptable variants

In table 1, we can see a clear interdependence between the amount and intensity of students' homework, and presumably the degree of their thinking and analytical activity, on the one hand, and their critical approach to terminological problems, as well as the efficiency of specialized terminology acquisition and use.

The subjects of group A completed the full amount of the planned independent work, which is mostly devoid of any signs of formal approach, i.e. we can assume a high intensity of their thinking and analytical activity.

The group B subjects also completed all planned independent work, but there are some indicators of formal approach in their translations – sporadic coincidence of shorter text fragments with the MT TT, non-systematic repetition of the MT errors, infrequent preservation of the MT unnatural word order, etc. Hence, though the intensity of their thinking and analytical activity was lower as compared to the group A subjects, its general level is sufficiently high.

The subjects of group C completed only half of the planned independent work. In addition, their homework translations contained a large amount of complete or partial coincidences with the MT TT. Thus, it seems logical to assume that the intensity of their thinking and analytical activity was considerably lower as compared with the subjects of the other groups.

The level of the subjects' homework independence strongly correlates with the quality of their test translations. Though the said levels in the test decreased as compared to their homework, it may be explained by the time limit in the test. It might make some students, especially closer to the deadline, occasionally consult the MT variant. However, the correlation between the groups remains stable.

The group A subjects' test translations had some indicators of formal approach inherent in the group B subjects' homework: irregular coincidences of shorter text fragments with the MT TT, occasional repetition of the MT errors, unnatural word order, etc.

The characteristics of the group B subjects' test translations slightly deteriorated as well – the share of MT edited fragments increased. No matter how substantial their transformations of the MT text were, the relationship to the latter was quite obvious. However, the difference between groups A and B remained stable – 2.6 points in their homework and 2.7 points in the test translation.

The group C subjects' rate of independence in their test translations as compared to the one in their homework did not change and remained low – 1.6 and 1.7 points respectively.

The subjects' level of critical approach to terminological problems correlates well with the efficiency of their solution in the test translation. The group A subjects, who displayed the highest independence rate in their homework and test translations (9.6 and 7.5 points respectively), have the highest index of terminological accuracy as well (70.7%). Similarly, the group B subjects, who go second by their independence rate (7.0 and 4.8 points respectively), have the second terminological accuracy index as well – 50.8%.

Bearing in mind the group C subjects' low independence rate in both their homework and the translation test (1.6 and 1.7 points respectively), their average terminological accuracy (46.1%) looks surprising as it lags behind the similar group B index only by 4.7%. Taking into account the substantial difference of independence rates in those groups, one could expect a more substantial disparity concerning their terminological accuracy as well. However, this paradox has a simple reason – a relatively high terminological accuracy index in group C is explained by their predominant reliance on the MT variants. Because the MT variant was acceptable in

every fourth case, it artificially improved the accuracy index of group C subjects who predominantly gave preference to the MT options.

It becomes evident if we compare the terminological accuracy rate in the cases where the MT options were acceptable versus the cases when they were not. As it follows from table 1, the group C subjects' accuracy rate (85.9%) in the first case (acceptable MT options) is almost equal to the similar rate in group A (87.9%) and even exceeds the one in group B (77.3%). However, it can be accounted for by the fact that the group C subjects nearly always copy the MT option in general, and if this option is acceptable, it improves their overall accuracy rate. For example, in relation to the acceptable MT options, the group C subjects copied them in 83.2% of cases, i.e. they used alternative acceptable variants only in 2.7% of them. In contrast, the group A subjects' variants coincided with the MT options only in 31.5% (out of 87.9%) of cases, with a similar picture in group B (36.4% out of 77.3%). In the remaining cases, the subjects of groups A and B used alternative acceptable variants.

This conclusion is corroborated by the subjects' performance when the MT suggested unacceptable options. Here, the subjects' terminological accuracy variance in different groups is closer to the expectations: group A – 63.0%, group B – 46.6% and group C – 22.7%, i.e. the difference between groups A i B amounts to 16.4%, between B and C – 23.9%, and between A and C – 40.3%. The advantage of groups A i B subjects in the critical approach to terminological problems is even clearer if we look at the coincidence rate with unacceptable MT options among the subjects of different groups. The said rate is15.5% in group A, 22.5% – in group B, and 49.1% – in group C. Thus, the group C subjects, even in the situation of the machine options' doubtful acceptability, rely on MT in translating every second term, while in groups B and A, it may be assumed only in every fifth and seventh terms respectively.

In general, the said coincidence rate analysis proves an unquestionable advantage of the students who demonstrated a higher intensity of their thinking and analytical activity throughout the entire period of study. The average rate of coincidences with the MT options constituted 21.2% in group A, 33.6% – in group B, and 52.9% – in group C. A considerable difference in the subjects' independence in terminological problems solution, as well as its efficiency among the students of various groups allows assuming that the said difference is caused by the dissimilarity in the intensity of the subjects' thinking and analytical activity.

Conclusions

The main objective of this study was to test the assumption that it is possible to enhance the development of the critical approach to the solution of terminological problems in translation, as well as of the specialized bilingual (English and Ukrainian) terminology acquisition by intensifying the students' thinking and analytical activity in their independent work. Our pilot experiment has confirmed that the said intensification may be provided for by post-editing machine-translated texts in combination with detailed verbal written explanations of all corrections made in the MT TT.

The intensity of the students' analytical and thinking activity compares well with their independence in the terminological problems solution in translation – the correlation of the students' independence rate with the various indices of the said activity remains stable irrespective of the translation environment (homework or translation test). The students with insufficient intensity of their analytical and thinking activity throughout the course of study have a tendency to excessively rely on MT terminological options giving the preference to them in over half of the cases, while the dependence on the MT options of students with a high intensity of their analytical and thinking activity is substantially lower.

There is also a good correlation between the intensity of the students' analytical and thinking activity with their success in the solution of terminological problems in translation. The higher is the said intensity, the better is the students' success rate, especially when the problems get more complicated. Under such conditions, the lack of the sufficient amount of independent work experience, as well as the absence of the required equivalents in their lexicon, encourage the students' excessive trust to MT options and results in a considerable deterioration of their specialized terminology recall accuracy.

The study has certain limitations. Those include a relatively small amount of participants and terminology, which were involved in the experimental teaching and learning. Further studies in this area could use more subjects representing a greater variety of educational levels, as well as a wider range of terminology from diverse domains. It could be considered the prospect of the further research.

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Appendix

The text of the translation test.

In order to understand what cognitive science is all about we need to know what its theoretical perspective on the mind is. This perspective centers on the idea of computation, which may alternatively be called information processing. Cognitive scientists view the mind as an information processor that must both represent and transform information. That is, a mind, according to this perspective, must incorporate some form of mental representation and processes that act on and manipulate that information. Cognitive science is often credited with being influenced by the rise of the computer. Computers are of course information processors. They perform a variety of information processing tasks. Information gets into the computer via input devices and can be stored there. The information can be processed using software. The results of this processing may next serve as output. In like fashion, we may think of people performing similar tasks. Information is "input" into our minds through perception. It is stored in the memory and processed in the form of thought. Our thoughts can then serve as the basis of "outputs," such as language or physical behavior. Of course, this analogy between the human mind and computers is at a very high level of abstraction as the former is difficult to investigate, especially in longitudinal studies, which can suffer from attrition due to the subjects' dropout. It concerns language impairment cases, brain injuries, mental illnesses, etc. To investigate neural nets, the researchers use, among other methods, transcranial magnetic stimulations and stochastic modelling.