

Simulating Hamlet: Questions, Cautions and Critique.

Journal of System Dynamics Applications Vol. 1, No. 4 pp 73 – 88 (2012)

Tim Haslett PhD
Linchpin Consulting
1/164 Highett St
Richmond 3121
Victoria
Australia
thaslett@bigpond.net.au

Abstract

This paper explores the implications of the use of System Dynamics to model dramatic works and examines the model used in Pamela Lee Hopkins' "Simulating Hamlet in the classroom". This paper addresses this issue from both a literary and a modelling perspective. It begins by discussing the use of System Dynamics modelling in literature within the framework established by Forrester. Two aspects of the model, motivation and evidence revelation, are then examined against evidence from the text, supported by some historical information. Some of the difficulties inherent in modelling drama are highlighted and the paper concludes that the model does not adequately capture the complexity of the play because System Dynamics modelling is not an appropriate tool for literary analysis.

Key Words: Hamlet, simulation, literature, time.

This paper has been developed in response to the conjunction of two quite disparate disciplines: System Dynamics and Shakespearean criticism. At the heart of the discussion in this paper are two fundamental contradictory assumptions. Shakespearean criticism aims to broaden the understanding of the plays but not necessarily produce consensus whereas System Dynamics aims at consensus through an understanding that is based on experimentation with the fundamental structures and dynamics of the system in question. In relation to Shakespearean criticism, Maynard Mack (1952) observed

I know too well, if I might echo the sentiments of Mr. E. M. W. Tillyard's, that no one is likely to accept another man's reading of Hamlet (and) that anyone who tries to throw light on one part of the play usually throws the rest into deeper shadow

It is with this warning in mind that the paper explores the challenges inherent in combining System Dynamics modelling and Shakespearean criticism.

It is appropriate and natural that the use and application of System Dynamics modelling in the school curriculum will inevitably lead to its application in areas where it has not previously been used. In literature, applications have included William Golding's *Lord of the Flies* (Joy), *Romeo and Juliet* (Radzicki, 1991) and Margaret Mitchell's *Gone with the Wind* (Leslie, 1998). However, these applications need rigorous intellectual examination from the standpoint of the discipline of System Dynamics and from the perspective of literary criticism. Its use in literature raises the question of whether the conditions for the application of modeling (Forrester, 1961) can be met or whether a new framework of application can be designed. In suggesting that there are central questions to be answered in the application of System Dynamics to literature, the paper is designed as a cautionary note.

To begin the discussion, it is helpful to return to some fundamental principles of System Dynamics modeling. In "*Industrial Dynamics*", Forrester (1961) outlined "an industrial dynamics approach to enterprise design (which) progresses through several steps"

1. Identify a dynamic problem.
2. Isolate the factors that appear to interact to create the observed symptoms.

3. Trace the cause-and-effect information-feedback loops.
4. Formulate acceptable formal decision policies.
5. Construct a mathematical model of the decision policies.
6. Generate the behaviour through time of the system.
7. Compare results against output and available knowledge about the actual system
8. Revise the model until it is acceptable as a representation of the actual system.
9. Redesign, within the model, the organizational relationships and policies which can be altered the actual system to find the changes which improve system behaviour.
10. Alter the real system in the directions that model experimentation has shown will lead to improved performance."

(Industrial Dynamics pg 13)

Similar steps were reiterated, nearly 40 years later, by Sterman (2000) in *Business Dynamics* where the principles for successful use of System Dynamics were outlined. Sterman included two caveats relevant to modelling *Hamlet*:

1. Force the "why do we need it" discussion
2. Use expert modelers not novices [modeling requires a disciplined approach and an understanding of business, skills developed through the study and experience]

(Business Dynamics pg 79)

Clearly, there are a number of fundamental assumptions in the application of System Dynamics modelling:

1. There is a tangible and quantifiable system that can reasonably be interpreted as a stock-flow-feedback control system
2. There is a consensus that there is a problem with the system that can be described in terms of behaviour over time.
3. A group of decision-makers has a legitimate interest in improving the system.
4. Identifying and solving the problem will improve the operation of the system.
5. It is possible to change policy and structural elements of the system.

These assumptions gives rise to a number of questions that a would-be modeller of *Hamlet* may choose to address:

1. "What is the dynamic problem in *Hamlet*?" Are there concerns with the structure or plot of the play or are we concerned with the nature of Hamlet's problem, which are concerns of a psychological nature?
2. "What is the system to be modelled in *Hamlet*?" This system will need have a clearly defined stock-flow structure that can be plausibly argued to be generating the problem and, in particular, identify those parts most critical to System Dynamics modelling, the feedback structures.
3. "What is the case for changing or improving *Hamlet*?"
4. "How will the system be improved?" If the problem is with the plot and structure of the play, then clearly someone should re-write the play. If the problem is with Hamlet himself, then some process of self-improvement will help. These two issues are inter-related. If Hamlet's character is to be changed so that he kills Claudius earlier then this will have significant ramifications for the rest of the play.
5. What changes to policy and structure will bring about the desired improvements?
6. "Who will be the arbiter of the standards used to judge that *Hamlet* is a better play or that Hamlet is a better person as a result of a System Dynamics intervention?"
7. Models are usually built from data provided to the modeller by the participants who are involved in current, real-life interactions with each other and with the system itself. Such interactions are denied the Shakespearean modeller so the modeller must decide what data is to be collected from the text.
8. While models of industrial managerial and social systems are usually built to improve systems deemed to be problematic, Shakespeare's plays are not conventionally referred to as problems.
9. Conventional SD models assume that time is continuous whereas time is often not continuous in *Hamlet* where parallel plot intersections and flashbacks are stock in trade. A Shakespearean modeller will need to explain how a continuous flow model will deal with these problems.

Defining the Problem

Let us now turn our attention to the first of these issues to explore the difficulties in problem definition. Most Shakespearean criticism concerns itself with the central character. The nature of Hamlet's problem has preoccupied Shakespearean critics and the

idea that he delays killing Claudius is central to this preoccupation. A C Bradley defined the root of Hamlet's problem as melancholy, one of the five humours of Elizabethan psychology. Today, we would probably describe it as depression. This melancholy/depression makes Hamlet incapable of action. Hamlet himself hints at such a fault.

So oft it chances in particular men,
That through some vicious mole of nature in them
Carrying, I say, the stamp of one defect,
Their virtues else - be they as pure as grace,
Shall in the general censure take corruption,
From that particular fault. *Act I Sc iv*

The issue of the “problem” goes straight to the heart of the play. In addition to the “vicious mole of nature”, Hamlet has a set of complex, discrete and yet interrelated problems.

1. His mother's “o'er hasty marriage”,
2. An uncle who “hath killed my king, and whored my mother, Popped in between th'election and my hope”,
3. A ghost who may be “a spirit of health or goblin damned”.
4. A girlfriend who rejects him and returns his letters saying “rich gift wax poor when givers prove unkind”

At a political, as distinct from a personal level, all this translates into concern at court over Hamlet's behaviour. Claudius speaks of:

Hamlet's transformation: so call it
Sith nor the'exterior nor the inwards man
Resembles what it was.

Act II sc ii

Claudius is wary of Hamlet. While he grants Laertes permission to return to Paris, he pointedly denies Hamlet permission to return to school in Wittenberg and then charges Rosencrantz and Guildenstern to keep the young pretender under close watch. The audience watches the interplay between the personal and political manifestations of Hamlet's dilemmas. Analysis of Hamlet is subject to Heisenberg's Uncertainty Principle: The more we focus on single aspects of his character the more we lose sight of the complexity that makes *Hamlet* a great play.

In *Simulating Hamlet in the Classroom*, Hopkins (1992) chooses to take a single cause approach by defining the problem in terms of motivation. The original work was developed by

A group of teachers working ... developed a STELLA model that analyzes the motivation of Shakespeare's Hamlet to avenge the death of his father. The model is designed to expose the effect that plot events have on Hamlet's willingness to kill Claudius. It permits the examination of the impact of each event as it occurs and as Hamlet continues to contemplate the situation.

The Hamlet model

The Hamlet model developed by Hopkins (1992) forms the basis for a discussion which raises a series of questions regarding the application of System Dynamics modeling methodology to developing an appreciation and understanding of *Hamlet*. The causal relations developed in this model are shown in Figure 1.

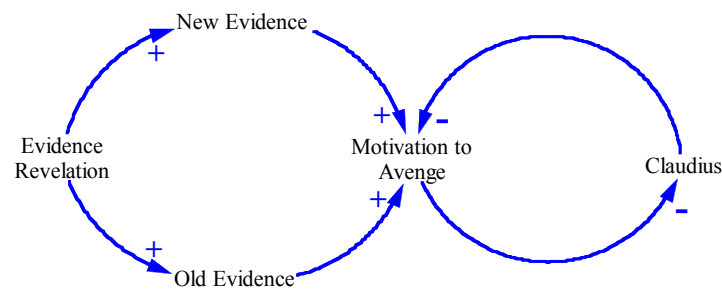


Figure 1: Causal Relations in *Hamlet* Simulation

The primary input to the system is Evidence, divided into New and Old, both of which have a differential impact on Hamlet’s motivation, which decreases Claudius (that Claudius is modelled as a stock is in itself problematic). Claudius’ death then reduces Hamlet’s motivation. In fact, Hamlet is dead shortly after Claudius so a decline in motivation is fairly natural.

The model consists of two stocks of “Evidence” (old and new), one of motivation “Motivation” and a rate variable of “Opportunity to Act”. It also contains a stock of “Claudius”. When the accumulation of “Evidence” that increases “Motivation” to a critical point where,

IF (Motivation_to_Avenge > 95) and (Opportunity_to_Act > .95) then Claudius else 0,

then Hamlet kills Claudius.

There are a number of difficulties with translating *Hamlet* into a model, both technical and textual. Let us deal with textual aspects of “Opportunity to Act” first. There is nothing in the play to suggest that opportunity is an issue for Hamlet. (The reasons for his delay are of a different nature and these will be discussed later.) The rate variable “Opportunity to Act” is shown in Figure 2. It is continuous and varies over time (as any good rate variable should) from between 0.19 and 1 (in the final scene).

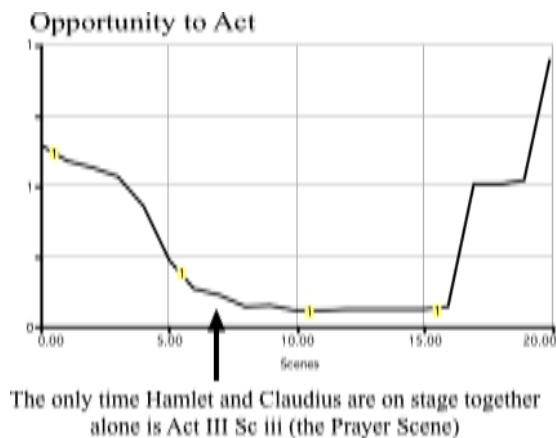


Figure 2: Hamlet's opportunity to act

A careful reading of the play will show that after Hamlet has seen the ghost, he is only on stage with Claudius in five scenes, only two of which, the Prayer Scene and the final scene, could reasonably be interpreted as opportunities. The prayer scene is one of great dramatic irony where opportunity collides with Hamlet's finely tuned religious sensibility. Figure 2 does not reflect this but does show Hamlet's opportunity increasing through Act IV Sc v, the scene of Ophelia's madness, Act IV Sc vi where Horatio receives word of Hamlet's return and Act IV Sc vii where Claudius suborns Laertes and Ophelia's death is announced. In all of these scenes, Hamlet is still on his way back to Denmark. While it appears unlikely that there is new evidence being revealed to Hamlet during this period, this aspect of the model raises the questions of time and continuity and the extent to which the modeller should speculate about what happens off-stage, issues that will be discussed later in the paper.

A similar problem of continuous flow exists with the "Evidence". Figure 3 shows Evidence revelation as a continuous flow through out the play, which it is not. It also shows the accumulation of New and Old Evidence.

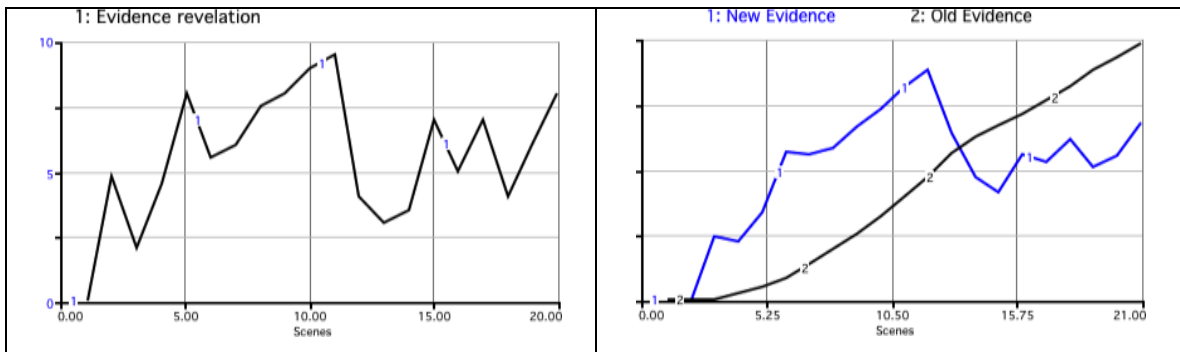


Figure 3: Flow of Evidence revelation and accumulation of Old and New Evidence

The accumulation of Old Evidence is a natural consequence of the aging chain structure used in the model (shown in Figure 4) but it must be questioned whether this dynamic is an adequate representation of the action of the play.

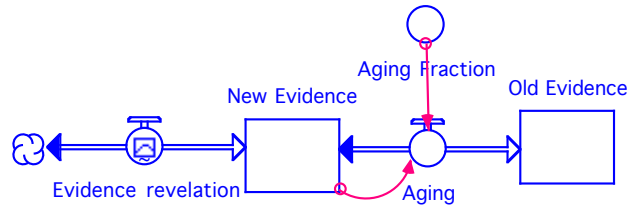


Figure 4. The Evidence aging chain.

Evidence revelation occurs in two scenes, the appearance of the ghost (Act 1 Sc v) and the play scene (Act III Sc ii). Figure 3 show an “evidence” revelation peak in Act 1 Sc ii where Claudius is holding court and Hamlet gives his first soliloquy. The next peak is in Act 1 Sc where the ghost speaks to Hamlet. This raises an interesting and peripheral question: What is being modelled here? Is ‘Evidence Revelation’ a revelation to the audience, as it is in Act 1 Sc ii when Hamlet speaks of his revulsion of his mother’s marriage, or to Hamlet (and by implication to the audience), as is the case in the ghost scene.

There is another peak in Evidence revelation at Act III Sc iv (the closet scene). However, the ghost does not present Hamlet with new evidence. His purpose is “To whet thy almost blunted purpose” and to remind Hamlet:

Taint not thy mind nor let thy soul contrive
 Against thy mother aught *Act 1 Sc v*

There is another peak at Act IV Sc iv where Hamlet sees Fortinbras’ army marching against Poland. The scene strengthens Hamlet’s resolve but does not present new evidence. Similarly, there is no new evidence presented at the next peak in Act IV sc vi when Horatio learns of Hamlet’s return.

The fundamental problem that arises from a continuous flow approach to “evidence” is that it can leave the neophyte reader with the wrong impression, namely that the events of the play serve as a continuous reminder to Hamlet. The implication is that he lacks “motivation” which is all too simplistic a view.

The simulation suggests, that throughout the play the weight of evidence and Hamlet's motivation accumulates to a point where Hamlet finally acts. However, such an interpretation ignores the pivotal nature of the play scene and the changes it brings about in Hamlet. At the end of the scene, Hamlet has become a bloodthirsty revenger.

Hamlet: I'll take the ghost's word for a thousand pound...

Now could I drink hot blood

Act III Sc ii

The play scene changes Hamlet in profound ways and from this point, the play rushes to its tragic climax. In next scene, in his mother's closet, Hamlet mistakenly kills Polonius. His immediate reaction is "Is it the King?" However, Hamlet's rash act has immediate consequences. Claudius quickly gains control of the situation, packing Hamlet off to England with Rosencrantz and Guildenstern and to certain death. When Hamlet returns, after having read and re-written Rosencrantz and Guildenstern's "grand commission", boarded a pirate vessel in a sea battle and convinced the pirates to return him to Denmark, he fights Laertes in Ophelia's grave. This is a much transformed and dangerous Hamlet and Claudius quickly convinces Laertes to kill Hamlet in a duel. In the meantime, Hamlet is determined to maintain the initiative and kill Claudius.

Horatio It must be shortly known to him from England

What is the issue of the business here.

Hamlet It will be short; interim's mine.

Act V sc ii

The continuous flow approach, inherent in System Dynamics modelling ignores one fundamental element of Hamlet's character: he changes from a reflective philosopher seemingly paralysed by his introspection to a man capable of bloody and decisive action after the play scene. The second half of the play is concerned with the tragic consequences of this change.

The nature of evidence in *Hamlet*

Hamlet's actions are driven by two fundamentally different events that reflect two quite different pieces of evidence: that of the Ghost and that from Claudius' reaction in the Play scene. For Hamlet, it is the second that confirms the first. The distinction is not that they are old nor new but that they are religious and secular.

Hamlet's problem is whether to believe the ghost or not. His scepticism is deeply rooted in the fundamental religious views that the play explores and which, for Hamlet, represent deep philosophical and religious problems. Hamlet's desire to return to Wittenberg is significant because it is there that Martin Luther preached a new Protestant view of the afterlife. The medieval Catholic view was that after death, souls went to purgatory to be cleansed of their sins before ascending to heaven. In particular, sinners who did not receive the last sacrament went to purgatory until their sins were purged, or in the case of the ghost, until justice was done for wrongs done to them in their lifetime. These souls could be manifest to the living who then had an obligation to act on their behalf. Hamlet's father appears to be such a Catholic ghost.

The Protestant view, by contrast, proposed that there was no purgatory where sins were purged. Souls either went straight to heaven or straight to hell. Returning souls were sent by the devil to tempt the living to sin and eternal damnation. So Hamlet, the student from Wittenberg, has serious doubts about the nature of the ghost. The first half of the play is concerned with Hamlet's desire to confirm the veracity of the ghost's word. As a good Renaissance scholar, he seeks secular evidence for this.

Hamlet The spirit I have seen
May be a devil and the devil hath power
T'assume a pleasing shape, yea and perhaps
Out of my weakness and my melancholy
As he is very potent with such spirits

Abuses me to damn me. I'll have grounds
More relative than this. The play's the thing
Wherein I'll catch the conscience of the king.

Act II sc ii

These are not trivial issues for the Shakespearean audience. Two successive monarchs, Mary and Elizabeth had been burning heretics at the stake on such questions of dogma. Evidence does not accumulate in *Hamlet*; the protagonist needs just two pieces for his puzzle. Once he has them, the play begins its headlong descent to its final tragic ending.

Issues of Structure

It is a truism in System Dynamics that structure determines behaviour. It could also be argued that this is true in Shakespearean drama but in a rather different way. The structure of Shakespeare's plays, and *Hamlet* in particular, is shaped by two important literary traditions.

It is clear at the beginning of the play that Hamlet has a very specific problem: his mother is now married his uncle. This is further complicated by revelations of the ghost regarding his father's death. These two problems are embedded in a highly specific structure, that of the Revenge Play. McGinn (1938:13) argues that the *Hamlet* is a revenge play whose:

principal agents are the murderer and the avenger. The one is instigated to crime through such motives as ambition or lust; the other is prompted to revenge by a sense of duty, also usually by reminders of the dead; and both are involved in an action of delays or intrigue, of crime and bloodshed, through which the final act of justice is reached.

The revenge play derives from the work of the Roman playwright and Stoic philosopher Seneca the Younger (Miola, (1992). Thomas Norton's *Gorboduc*, Thomas Kyd's *The Spanish Tragedy* and *The Revenger's Tragedy* variously attributed to Tourner and

Middelton were all well-known and popular examples of this genre in Shakespeare's time. Shakespeare was clearly aware of Seneca when he has Polonius say " Seneca cannot be too heavy, nor Plautus too light" (Martindale, 1990). As a playwright and actor, he would certainly have been aware of the work of his four contemporaries. Revenge plays were full of gruesome and often darkly comic violence. The Senecan model included:

- A secret murder, usually of a benign ruler by a bad one
- A ghostly visitation of the murder victim to a younger kinsman, generally a son
- A period of disguise, intrigue, or plotting, in which the murderer and the avenger scheme against each other, with a slowly rising body count
- An eruption of general violence at the end that generally decimates the everyone, including the avenger

(Mabillard, 2000)

The revenge play clearly has a defining role in the structure of *Hamlet*. However, it is of an altogether different nature from structure in the System Dynamics modelling sense. Here the constraints of the genre dictate the sequence of the plot, including the delays, the characters and the ending.

The second major literary convention that influenced Shakespeare work is the five-act structure. Deriving from Aristotle's *Poetics*, and outlined by Freytag in *Die Technik des Dramas* in 1863. The five-act structure consists of

- Act 1 (Exposition) which is primarily concerned with the revelations of the ghost and one act with Laertes warning Ophelia about Hamlet
- Act 2 (Rising Action) sees Ophelia's rejection of Hamlet, the arrival of Rosencrantz and Guildenstern and the players.
- Act 3 (Climax or turning point) contains the nunnery scene where Hamlet confronts Ophelia, the play scene where Claudius' guilt is confirmed and closet scene where Hamlet confronts his mother and kills Polonius.

- Act 4 (Falling action) where Hamlet is sent to England, Ophelia commits suicide and Laertes returns demand revenge.
- Act 5 (Resolution or Catastrophe) contains Hamlet's return, the graveyard scene and the events leading to the deaths of Gertrude, Polonius, Laertes and Hamlet.

These two literary traditions shape the structure of *Hamlet*. The challenge for the Shakespearean model builder is to articulate these structures within the stock-flow conventions.

Judging Model Validity

In commenting on model validity, Forrester stated: "The purpose of industrial dynamics models is to aid in the design of improved industrial and economic systems." Putting aside the distinction between Industrial and Shakespearean systems, the case still needs to be made for the improvement of a Shakespearean play, or as Sterman put it, we must "Force the "why do we need it?" discussion".

The immediate question is "What improvements should be made to Hamlet?" The model seems suggest that if Hamlet were more motivated that he would kill Claudius earlier. The best case scenario in this model which maximizes Evidence revelation, Opportunity to Act and the Motivational index has Claudius dying, presumably murdered by Hamlet, in Act II Sc i. Unfortunately, this would need to happen offstage as this particular scene involves Polonius, Reynaldo, Laertes and Ophelia with neither Hamlet not Claudius on stage. But the question must surely be "What possible cause is served by ending the play in the second act?"

These types of questions are an inevitable outcome of simulation. Forrester (1968:119) suggested that the first test of model is to demand that "its behaviour not be obviously implausible." Does having Claudius die in Act II constitutes what Forrester terms a "failure of the model to perform as would be expected of the actual system."?

This case for plausibility of such a scenario must be argued and supported from the text. The case needs to be made that having Claudius die earlier constitutes a plausible and improved scenario for the play. Such an argument would need to explain how the play can be constructed without Claudius and still maintain some degree of faithfulness to the text. For instance, what will happen in the final scene? Who will suborn Laertes? Who will poison the wine? The only possible contender for the first task is Gertrude, now that Polonius, Claudius and Ophelia are all dead. But why would she kill her own son? And why would she then knowingly drink the poisoned wine? Questions of plausibility and faithfulness to the text become critical when considering such alternative scenarios.

The nature of time and character

The idea that time is continuous is fundamental to System Dynamics modeling. This is not always the case in drama or literature. The *Hamlet* simulation runs for 20 time periods – one for each scene. A purist would quibble that the scenes are not of equal length nor is the time between them the same. For instance, we know the play scene and the closet scene are sequential but that the time between Hamlet's departure and return must allow time for sailing, the pirate attack and a journey back to Elsinore. The action of the play is not continuous and stocks do not continue to accumulate during these periods of time.

The nature of the plot further confounds the continuity of time. As an audience, we see a continuous plot but this must not be confused with continuous time. What we are seeing is the punctuated and fragmented parts of the characters' lives, not a continuous accumulation of stocks. Time is a complex issue in this play and the idea of action continuing off-stage is explored in Tom Stoppard's brilliant *Rozencrantz and Guildenstern are dead*, which is punctuated by the scenes that Rozencrantz and Guildenstern play in *Hamlet* and which creates the continuous story these two minor characters.

Conclusion

A final and concluding caveat: the detailed discussion of the nature of time and the modelling of the two variables in the model is a manifestation of a deeper issue in this approach to literature and drama in particular. Building models of a play such as *Hamlet* assumes a closer link between real-life and drama than really exists. A play "holds a mirror up to nature"; it is not nature itself, but a reflection. This reflection is, in the first instance, in the text and in what the author selects and chooses to portray. The reflection is also in the performance of play and in what the producer and the actors choose to portray. Each performance will differ from all other performances in subtle and not so subtle ways. A work of art exists in its re-creation in performance and in the audience response to that performance. The challenge to System Dynamics, in this particular case, is to show that it can provide insights not gained in 400 years of performance and commentary. Perhaps, as they say in Australia, we should let this one go through to the keeper and avoid the problem indicated in Figure 5.

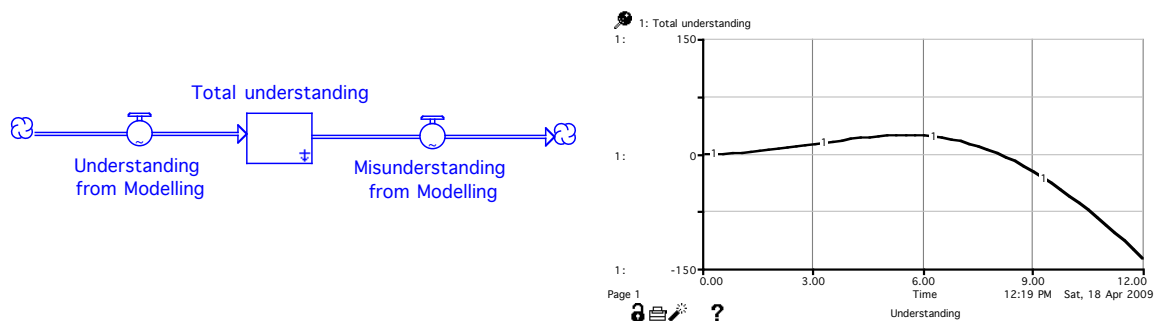


Figure 5: Problems in modeling *Hamlet*.

Bibliography

Benardete, S, & Michael Davis, M. (2002) *Aristotle On poetics* St. Augustine's Press

Bradley, A.C. (1902) *Shakespearean Tragedy* McMillan London

William Farnham, *The Medieval Heritage of Elizabethan Tragedy*, revised edition, (Oxford: Basil Blackwell, 1956)

Forrester J, W. (1961) *Industrial Dynamics*' MIT Press Cambridge Mass

Freytag, G. (1865) *Die Technik des Dramas* Darmstadt

Heisenberg, W. (1927), Über den anschaulichen Inhalt der quantentheoretischen Kinematik und Mechanik, *Zeitschrift für Physik* **43** (3–4): 172–198,

Hopkins, Pamela Lee (1992) *Simulating hamlet in the classroom*. System Dynamics Review vol. 8 no. 1, 91-98.

Joy, T. (undated) *Simulating the End of Innocence: dynamic models for Lord of the Flies* Creative Learning Exchange: System Dynamics and Systems Thinking in K-12 Education

Mabillard, A. (2000) *Introduction to Hamlet*. Shakespeare Online.
<http://www.shakespeare-online.com/plays/hamlet/hamletintroduction.html>

McGinn, D. J. *Shakespeare's Influence on the Drama of his Age*, New Brunswick, Rutgers Univ. Press. 1938, pp.13-14

Miola, R.S. (1992), *Shakespeare and Classical Tragedy –The Influence of Seneca* Clarendon Press

Martindale, C. & M (1990), *Shakespeare and the Uses of Antiquity* Routledge

Mack, M. (1952) *The World of Hamlet* The Yale Review XLI pg 502 – 523

Leslie A. M. (1998) *Second-Order Systems* MIT System Dynamics in Education Project

Radzicki, M. (1991) Dyadic Processes, Tempestuous Relationships, and System Dynamics. In K, Saeed, D. Andersen & J. Muchuca, (Eds.), *Proceeding of the System Dynamics Conference*: Vol. 10.

Sprott, J. C. (2004) *Dynamical Models of Love* Nonlinear Dynamics, Psychology, and Life Sciences, Vol. 8, No. 3, July, 2004

Shakespeare, W. *Hamlet* (ed. Edward Hubler.) The Signet Classic Shakespeare, 1963.

Stoppard, T (1967) *Rosencrantz and Guildenstern Are Dead*. Grove Press

Sterman, J. D. (2000) *Business Dynamics*. Boston: Irwin McGraw-Hill.