Effect of Accounting Standards on Uniformity and Innovation in Accounting Practice: a Simulation Study *

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March 8, 2018

Abstract

I investigate how accounting standards and communication patterns between accountants affect uniformity and innovation in accounting practice. Prior accounting thought suggests that accounting standards increase uniformity of practice at the cost of decreasing innovations in accounting practice. For example, the FASB claims that "one of the most important reasons that financial reporting standards are needed is to increase the comparability of reported financial information" and that consistency of practice, while not identical to comparability, is helpful in achieving comparability (FASB statement 8, 2010 pgs. 29 19). Others have expressed concern that accounting standards reduce innovations in accounting practice (e.g. Sunder 2010). I investigate the alleged trade off between uniformity of accounting practice and innovations in accounting practice by using an agent based simulation model inspired by Basu, Madsen, Reppenhagen, and Waymire (2013, BMRW hereon). BMRW find that increased communication between accountants increases innovation, leading to better performance on a complex task. I document a form of communication that leads to decreased performance on the same complex task. With regards to standard setting, I find that accounting standards not only reduce innovation in practice, but also reduce uniformity in practice under some conditions. This is in contrast with the conventional wisdom that standards increase uniformity in practice. The results suggest that efforts to implement accounting standards for the sake of uniformity may be misplaced. The results also provide guidance for when communication between accountants can improve (or harm) accounting practice.

*I appreciate helpful comments from Dain Donelson, Steve Kachelmeier, Volker Laux, Ross Jennings, John McInnis, and Brian Monsen.

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Keywords: simulation, standard-setting, uniformity, innovation, accounting

1 Introduction and Background

I study the effect of accounting standards on uniformity and innovation in accounting practice. While previous thought suggests a trade off between uniformity and innovation in accounting practice, my model finds that uniform standards reduce not only innovation in accounting practice, but also uniformity in accounting practice. Uniform standards inhibit innovation in accounting practice by preventing accountants from experimenting with new methods, leading to a cost of foregone innovation (e.g. Sunder 2010). In their simulation model, BMRW observe that agents (representing accountants) find improved solutions to complex task over time by experimenting and communicating with one another.

One potential benefit of accounting standards is comparability of financial statements resulting from consistency of accounting practice. In fact, the FASB states that “one of the most important reasons that financial reporting standards are needed is to increase the comparability of reported financial information” (FASB statement 8, 2010 pg 29). The same concept statement also notes that consistency of practice, while not identical to comparability, is helpful in achieving comparability (pg 19).

Several other papers have investigated the costs and benefits of standard setting, but none have focused specifically on the trade off between increased uniformity in practice and foregone innovation in practice. For example, Ray provides an analytic model for the costs and benefits of uniform financial reporting (2011). His model investigates the trade off between cost of compliance and total capital in the economy. Cost of compliance represents the difference between the mandated accounting method and the existing method the firm would choose if unregulated. While cost of foregone innovation could be considered a “cost of compliance” in the general sense, it is not a part of the cost of compliance modeled by Ray. Ray’s cost of compliance assumes firms already have an optimal accounting method in mind which they would use if they were not obligated to follow the standard. In contrast, cost of foregone innovation represents the possibility that firms and their accountants don’t even know any better accounting methods for many transactions. Since accountants do not know the optimal accounting method, they move closer to the optimal method over time through a process of trial and error.

The benefit of accounting standards in Ray's model is increased capital in the economy. This is because "a uniform standard allows investors to compare investment opportunities across the economy more easily" which "draws investors into the marketplace" (pg 3). Thus, for Ray, accounting standards can be beneficial *because* they lead to increased comparability.

Jamal and Sunder (2014) also provide evidence on the trade off between innovations in practice and consistency of practice. They use regulation in the telephone industry as a case study of how monopoly regulators affect "innovations in quality" and "coordination." Their analysis takes as given that uniform standards provide coordination benefits, but ultimately concludes against uniform standards due to the high cost of foregone innovation.

Note that both the FASB and the existing academic literature implicitly assume uniform standards increase uniformity of practice. My study calls this assumption into question by outlining conditions where uniform standards reduce uniformity of practice in an agent based simulation model.

I test whether uniform standards increase uniformity of practice by extending the agent-based simulation model used by Basu, Madsen, Reppenhagen, and Waymire (2013, BMRW hereon). Agent based simulations are good for modelling how relatively simple behaviors of agents aggregate into broader social phenomenon (e.g., Esptein 2007, Axelrod 1997). Agent-based simulations have been used in a variety of hard science and social science settings.[1] Studies of standard setting, communication between accountants, and evolution of accounting practice are especially well suited for simulation study because they involve large numbers of heterogeneous agents, complex interaction structures between agents, and parallel decision making among agents. For these reasons, I follow BMRW in using an agent-based model.

In the BMRW model, agents attempt to solve a maze (a complex problem) in as few moves as possible (i.e. as effectively as possible). Agents repeat the maze for multiple rounds, al-

[1]See, as a starting reference, the papers from the National Academy of Science colloquium on Agent Based Simulations http://www.pnas.org/content/99/suppl$_3$

lowing them to learn and improve their performance over successive rounds. We can think of the agents as representing accountants faced with a complex task, like choosing a method to account for a new economic transaction, which they would like to complete as effectively as possible. There are many different ideas for what "effective" means in the context of choosing an accounting method, but for simplicity of explication, "effective" means "representationally faithful." That is, accountants search for accounting methods which are the most representationally faithful.[2] Thus, paths out of the maze represent accounting methods for a transaction, and the lengths of these paths measure the representative faithfulness of the numbers produced by that method. Shorter paths indicate more representatively faithful methods and longer paths indicate less representatively faithful methods. We can think of path length as representing any other accounting method quality that accountants might strive for, and the main results of this model would still hold.

BMRW show that, even in the absence of standard setting, agents will cluster on a small number of paths if they can communicate between rounds. Although the main point of their study is to show how information sharing leads to norms in accounting practice, their results also lead to a bigger question about standard setting–specifically about the trade-off between uniformity of practice and quality innovations in practice (quality and faithfulness are interchangeable hereon). By showing that agents cluster on a small number of solutions even in the absence of standard-setting, BMRW lead us to question whether the uniformity benefits of standard setting are worth the innovation costs. To provide evidence on this question, I extend BMRW in two ways. First, I model the possibility that agents value uniformity and try to arrive at similar solutions to each other even in the absence of standard setting. Second, I incorporate a standard-setter into the model so that I can make direct comparisons between the paths chosen in mazes with and without standard-setters.

First, I allow for the possibility that agents will recognize the benefits of uniformity and

[2] We don't have to think about the most effective method as being the most representatively faithful, we could think of it as "the accounting method that maximizes firm value." As long as there is some idea of "effective" when it comes to accounting method choice, we can interpret the results of the simulation through that lens.

attempt to create uniform paths on their own, without a standard-setter. This corresponds to the assumption that comparability and uniformity of accounting practice are inherently valuable, in which case accountants in the unregulated market should desire these properties in addition to faithful representation. I model agents' desire for uniformity by introducing a new model parameter, called collectivism. More collectivism implies a higher probability of moving towards other agents, which would be one way for unregulated agents to increase uniformity in the absence of a standard setter. Note that the type of communication implied by the collectivism parameter is qualitatively different than the type of communication modeled by BMRW. In BMRW communication, agents communicate with other agents between rounds, not during rounds, so they can observe each others' full paths to determine which one is shorter. In the collectivist communication, agents only see the present location of the other agent, not the full path, so they don't know how long the other agent's path will be.

There are several reasons why people might use "collectivist" communication in the real world. For one, the BMRW type of communication may not be available. Sometimes, we must choose whether to follow someone else before knowing the quality of their solution, perhaps because we are solving a new type of problem, or perhaps we are not qualified to judge the quality of someone else's solution. Second, collectivist communication can improve solution quality for some agents. For example, imagine that you are one of 101 agents in the model, and 95 of the others have found the solution. If 95/100 other agents are sitting at the exit, picking another agent at random and moving towards them is a pretty good strategy for exiting the maze. Thirdly, outside forces could increase the desire for similarity, motivating agents to move towards one another. For example, a company may use the same accounting method as another so they can claim to be following a convention when their accounting choices are scrutinized. Firms might also choose similar accounting practices to other firms to increase the comparability and decision-usefulness of their own accounting numbers, in an effort to decrease their own cost of capital.

While collectivism can potentially reduce path length in some cases, it can also increase path length. If collectivism is very high, agents will move towards each other at the cost of moving towards exits. This is easy to see in the case where agents always try to follow other agents, as no agents will leave the maze entrance because they are all moving towards other agents, all of whom are at the maze entrance. Qualitatively, when every agent is trying to "follow", stationary herds form, with each herd member only wanting to move towards the center of the herd. As it turns out, this form of collectivist communication violates the categorical imperative laid out by Kant in his Groundwork for the Metaphysics of Morals: when every agent becomes a follower to reduce their path length, every agent ends up with a longer path.

My analysis of collectivism suggests that low levels of collectivism generally do not affect path length or path similarity, but at higher levels, increased collectivism increases average path length without providing substantial increases in path-similarity. This contrasts with BMRW communication, which improves path length and path similarity across the board. These results have broad implications for accounting policy, and for many other collective learning problems: agents are generally better off moving randomly than following others when unable to evaluate the quality of others' full solutions. Agents are most likely to benefit from following when (1) following is a rare strategy amongst other agents and (2) most other agents have found a solution.

The pitfalls of collectivist communication provide a direct motivation for introducing accounting standards. If agents (accountants) want to use similar solutions (accounting methods) as each other, but collectivist communication cannot produce this outcome in the free market, standard setters could provide a social benefit by solving the collective action problem. I model standard setting as follows. Accountants, faced with a new type of transaction to account for, have a fixed amount of time to freely experiment before the standard setter establishes a standard. After the fixed amount of time ends, the standard setter chooses the most common accounting method (the generally accepted accounting principle), and codifies it as a standard. From then on, all accountants must follow the standard. Of course, standards provide some room for interpretation, so accountants can still experiment with new accounting methods, but only by making small deviations from the current standard.

Incorporating this model of standard setting into the simulation, my results suggest that mandatory accounting standards (1) reduce innovations in accounting quality, as predicted, but also (2) reduce uniformity in accounting practice, contrary to common expectation. The rest of the paper proceed as follows: section II describes the model and model parameters without standard setting. Section III discusses collectivism and displays related results; section IV introduces standard setting and displays related results, and section V concludes.

2 Model Design

In the basic model, agents represented as red squares are faced with a complex task–exiting a maze. The maze is an N*N grid of blue spaces, with each space connected to its neighbors above, below, and to either side. The maze has two exits, which are white spaces, one in a randomly selected corner of the grid, and one in a randomly selected edge of the grid. See example 1 for an example of a maze[3]. Each agent begins in the center of the grid, and moves to an adjacent space following an algorithm specified by the model parameters (described in detail later). The agent continues to move to adjacent spaces until it reaches an exit. When all agents have reached an exit, or when a fixed amount of time has passed, the first "round" of the maze is complete, and each agent has a memory of the path it took during the round. See example 2 for an example round played by 20 agents on a 9x9 grid. Depending on the model parameters, each agent may or may not remember the full path they took on a given round. After each round, agents can communicate their memories to each other. However, agents can only hold bring one memory with them to the next round. Agents choose between keeping their own memory or adopting the memory of another agent

[3]examples are in the appendix, except examples 2 and 4 which are animated and can only be viewed online

they communicated with using an algorithm determined by the model parameters. After agents update their memories, they are moved back to the center of the maze and the next round begins. The maze is repeated K times, with K chosen as a model parameter. In most parameterizations, agents should improve their performance (as measured by path length to exit) over successive rounds as they learn and communicate more about the maze.

2.1 Model Parameters without Standard Setting

The basic model parameters are *maze-size, number-of-agents, rounds-per-maze, give-up-eventually*, and *give-up-after*. The modeler chooses these parameters to govern how mazes are set up, when rounds end, and how many rounds are run for each maze.

Maze-size can be any odd number. *Maze size* represents task complexity, because large mazes require longer paths to reach an exit and allow for dramatically more possible paths.*Number-of-agents* can be any positive integer. *Rounds-per-maze* can be any positive integer. *Give-up-eventually* is a True/False; if it is TRUE, each round ends after a fixed number of moves regardless of how many agents have reached an exit, if FALSE, each round ends only after every agent has reached an exit. *Give-up-after* is the limiting number of moves per round if *give-up-eventually?* is TRUE. *Give-up-after* can be any positive integer, and it does not need to be specified if *give-up-eventually?* is FALSE.

The next parameter, *memory-length* governs how agents form memories as they complete a round. At the end of a round, each agent produces a list of every space they visited that round, in order visited. That list is converted into a memory by (1) keeping only the first *memory-length* elements of the list, and (2) removing redundant loops from the remaining first memory-length elements. *Memory-length* is set by the modeler to be any positive integer. Note, however, that if *memory-length* is shorter than the shortest possible exit path, agents will never be able to remember a full exit path. See example 3 for an example of removing a redundant loop from a path.

The next parameter, *collectivism*, determines how players move from space to space within a round. As in BMRW, the default algorithm is (1) agents who are on a space in their memory, move to the next space in memory and (2) agents who are on a space they don't remember, or are on the last space of their remembered path, move to a randomly selected neighboring space. The default algorithm runs when *collectivism* is set to 0. Collectivism can be set to any number p between 0 and 100, and represents the probability that agents will attempt to "follow" one another. When *collectivism* equals p, agents first complete step (1) of the default algorithm. Then, agents reaching step (2) have a $(1-p)\%$ chance of moving to a random neighboring space, as in the default algorithm, but, they also have a $p\%$ chance of selecting another agent at random, and moving to the neighboring space which puts them closest to that agent. This form of collectivism models a type of communication with substantially different properties and consequences than the communication forms studied by BMRW.

The last set of parameters are the communication parameters used by BMRW to govern how agents share memories with each other between rounds. *Prob-n-comm*, between 0 and 100, is the probability that agents will share memories with their neighbors, for a given round. Neighbors are mutually exclusive pairs of agents, stable across rounds. That is, if agents 1 and 2 are neighbors, they have no other neighbors, and they will remain neighbors for all *number-of-rounds* rounds of the maze. When neighbors share memories, they both inspect each others memories. If only one of the memories contains an exit, they both choose the memory with an exit. If both memories contain exits, they choose the memory with the shortest path length. If neither memory contains an exit, both agents keep their original memories. If *prob-n-comm* is greater than 0, number-of-agents should be even.

Prob-p-comm, between 0 and 100, is the probability that agents will share memories with their partnerships in a given round. Partnerships are stable, disjoint groups of agents with size partnership-size, chosen by the modeler. *Number-of-agents* should be a multiple of *partnership-size*. Note that if partnership-size = 2, we have created neighbors again. In partnership communication, the shortest complete memory path of any partner is disseminated to every other partner in the group. If no partner in a group has a complete memory path, partners keep their original memories.

Lastly, *prob-s-comm*, between 0 and 100, is the probability that agents will communicate with society for a given round. Agents communicate with society by randomly selecting another agent to compare memories with. Since agents will not necessarily select into the same pairs each round, information exchanged through society-sharing can eventually reach all other agents, given enough rounds.

After we select values for all the parameters, we "complete the maze." We can watch agents complete the maze in real time to get a feel for how agents behave under certain parameterizations. Watching a maze provides more information than looking at ex-post qualities of the maze (e.g. average final path length), but it is not feasible to watch every maze carefully, especially when hundreds of mazes are run for each parameterization. For each completed maze, I extract the following characteristics, based on the paths used in the final round: average path length, number of unique paths, and proportion of paths using the shortcut (i.e. non-corner) exit. These are the measures used by BMRW. In addition, I also compute the similarity of these paths using two methods: the Jaccard index, and the average Hausdorff distance[4]. Lastly, I compute the cumulative average path length for a maze by averaging the length of every agents path over every round.

3 Collectivism

I introduce collectivism to allow for the possibility that agents will value the benefits of uniformity, and try to create uniform paths on their own, without a standard-setter. This corresponds to the assumption that comparability and uniformity of accounting practice are inherently valuable, in which case accountants in the unregulated market should desire these properties in addition to faithful representation. I model agents relative desire for uniformity by varying the *collectivism* parameter. Higher collectivism implies a higher probability of

[4] I define these measures when I discuss results

moving towards other agents, which would be one way for unregulated agents to increase uniformity in the absence of a standard setter. Note that the type of communication implied by the collectivism parameter is qualitatively different than the type of communication modeled by BMRW. In the BMRW communication, agents observe each others' paths and determine which one is shorter, and choose which path to keep solely based on path length– not similarity. In the "collectivism" communication, agents only see the present location of the other agent, not the full path, so they don't know how long the other agent's path has been or will be.

Results on collectivism are documented in Figure 1 (at the end of this manuscript). I compare the effects of different combinations of collectivism and BMRWs societal communication on path length, number of paths, and path similarity.

Turning first to path length, notice that more collectivism leads to longer paths, but only when *collectivism* is greater than 35. When *collectivism* is less than 35, increased collectivism leads to small decrease in path length, but only if there is no societal communication available (i.e., only the red bars in Panel A are decreasing in height). The take away is that collectivism or "following" can marginally improve path efficiency if (1) there is no opportunity for societal communication and (2) agents only follow each other about a third of the time at most. However, when agents follow each other more than a third of the time, path lengths can increase dramatically. This happens through the channel of "stationary herding". When collectivism is high, agents move towards each other at the cost of moving towards exits. On average, agents move towards the center of mass of other agents, potentially creating large herds of agents which move very slowly. This is easy to see in the case where *collectivism* = 100. When *collectivism* = 100, agents never leave the neighborhood around the starting square, because they will always move towards a randomly selected agent, all of whom are also located at the starting square. The formation of slow-moving herds increases the average path length to an exit. See example 4 for an example of a stationary herd formation.

Turning to number of unique paths, collectivism has a different effect depending on whether BMRW's societal communication is present. When there is no societal communication, collectivism decreases the number of unique paths (see red bars in Panel B of Figure 2). When there is any amount of societal communication, collectivism increases the number of unique paths. This is a somewhat puzzling distinction. There could be a few mechanisms for the differential effect of collectivism. One possibility is that herds formed by collectivist communication help agents find solutions paths as group, reducing the total number of unique paths. At the same time, herds also lead to less efficient paths, which means the shortest paths are found too late in the game to be communicated across the population by societal communication. As a result, the herds caused by collectivism reduce the effectiveness of societal communication.

Turning to similarity, I document the effect of collectivism and BMRWs societal communication on the average Hausdorff distance between paths. The Hausdorff distance is a measure of how similar two paths are to each other. Informally, it is the distance between the paths at the place where they are most divergent from each other. Since Hausdorff distance is a measure of similarity between two paths, and since most simulation runs have more than two unique paths, I calculate the average Hausdorff distance over every possible pair of unique paths (Figure 1, Panel C). Collectivism reduces Hausdorff distance, but only when there is no societal communication. These results, in tandem with the results in panel A, suggest that in the absence of BMRW's societal communication, small amounts of collectivism can marginally improve path length and path similarity, but not number of unique paths.

These results have broad implications for accounting policy, and for many other collective learning problems: agents should never blindly follow another agent if they can instead wait to evaluate the other agent's path at the end of the round. If you will never have the opportunity to evaluate the other agent's path, it can be in your interest to blindly follow, but only if following is a relatively rare strategy among other agents. If following is a common strategy (more than 35% of agent-moves), then you're better off moving randomly than following.

4 Introducing Standard Setting

I introduce standard setting as follows: the modeler sets the value for a new parameter, *standards-begin*. For the first several rounds, the model runs as normal. After standards-begin rounds have passed, a standard is declared. The standard is the most common path at the end of standards-begin rounds. From this point on, agents continue to play as normal, but can only visit spaces that are within 1 space of the standard. See example 5 for an example of a standard and the allowable spaces implied by that standard. I allow agents to visit spaces that are only near the standard because FASB regulations still allow some room for discretion and experimentation. Furthermore, requiring all agents to use the exact standard path leads to a trivial observation: all agents choose the same path, with length equal to the length of the modal path at time *standards-begin*.

Figure two shows the effect of standards introduced at different times on path efficiency and path similarity for different levels of maze complexity. In univariate tests, holding all parameters constant except for *standards-begin*, I find that standard setting increases average path length. Furthermore, standard setting results in a greater number of unique paths. This suggests that accounting standards are not a straightforward trade-off between reduced innovation and increased uniformity of practice. Rather, standard setting may actually reduce both innovation and uniformity.

Of course, number of unique paths may not perfectly capture uniformity. Perhaps standards lead to a larger number of unique paths that differ by a smaller number of spaces. To capture this possibility, I calculate the Jaccard index and average Hausdorff distance over the set of unique paths from each simulation. These metrics allow us to compare how similar unique paths are to each other.

The Jaccard index is a measure of the similarity of several sets of points. It is measured as the number of points in the intersection of the sets divided by the number of points in union of the sets, all subtracted from one. Treating each unique path as a set of points, we can calculate the Jaccard Index of the agents' paths. Jaccard indices can range from 0 (no common points between paths) to 1 (all paths are the same). Smaller values represent more similar paths. The Jaccard index over the set of unique paths is not significantly different between standards and no-standards. This suggests that standards do not increase the similarity between unique paths.

The Hausdorff distance is a measure of how similar two paths are to each other. Informally, it is the distance between the paths at the place where they are most divergent from each other. Since Hausdorff distance is a measure of similarity between two paths, and since most simulation runs have more than two unique paths, I calculate the average Hausdorff distance over every possible pair of unique paths. The lowest Hausdorff distance occurs when standards are introduced after 25 rounds, and is significantly different from the Hausdorff distance in the absence of standards. In the low (high) complexity maze, standards at 25 rounds lower the Hausdorff distance by about 20% (10%). Overall, standards introduced at the optimal time (i.e. 25 rounds in) increase the number of unique paths by 200-1200%, but those unique paths are 10-20% more similar to each other. Taken together with the lack of variation in the Jaccard-index, these results suggest that standards do not increase uniformity in practice.

Note that for high complexity problems, introducing standards too early (e.g. at round 10 in the high complexity maze) can increase the number of unique paths and the Hausdorff distance (Panels B and E of Table 4). In this case, standards not only increase the number of unique paths, but also the dissimilarity of the paths. This suggests that for highly complex problems, standard setters should allow more time for experimentation before setting standards.

Although not readily visible in these tables, watching the simulations in real time exposes another cost of standard setting–compliance. For the first several rounds following standard implementation, path-length and number of unique paths spike to well above 100, and the number of agents who have a solution path in memory at a given time falls to near 0. This is because agents must search for new paths that are allowable under the accounting standard. This captures the idea that, in the real world, new standards leave ambiguity, requiring firms and accountants to do some amount of experimentation before finding an accounting method that satisfies the standard.

The final set of tests, documented in Figure 3, study the interaction between standard setting and collectivism. If standards reduce the negative consequences of collectivism, we should see standards improving path efficiency and path similarity when collectivism is high. The results in Figure 3 show that standards increase path length and number of unique paths in both high and low collectivism environments. Standards decrease Hausdorff distance in both cases, but there is no interaction effect. Taken together, these results suggest that standards do not solve a collective action problem induced by high levels of collectivism.

Overall, this simulation model suggests that accounting standards should not be viewed as a trade off whereby increased uniformity of practice is achieved at the cost of decreased accounting innovation. Rather, both uniformity of practice and innovation decrease in the presence of standards.

5 Conclusion

Extending Basu, Madsen, Reppenhagen, and Waymire (2013), I use an-agent based simulation model to investigate how accounting standards and different forms of communication between accountants affect uniformity and innovation in accounting practice. The agent-based simulation models accountants as agents faced with the complex task of solving a maze. Agents play the same maze multiple times, learning and improving their performance over successive rounds. In different parameterizations of the model, agents communicate either between rounds by comparing the lengths of each other's paths (as in BMRW), or during rounds, by moving towards each other's locations (which I call collectivism). I find that unlike the forms of communication modeled by BMRW, which generally improve path length and path uniformity, collectivist communication can be detrimental to both path length and path uniformity. Lastly, I incorporate standard setting into the simulation. After a fixed number of rounds, the modal path chosen by agents is codified as the "standard". From this point on, agents can continue to experiment with and communicate about new paths, as long as those paths are sufficiently similar to the codified standard. Overall, results suggest that standards reduce path uniformity and increase path length. Translating these results to accounting policy, the model suggests that there are conditions under which accounting standards impose costs by reducing uniformity and innovation of accounting practice.

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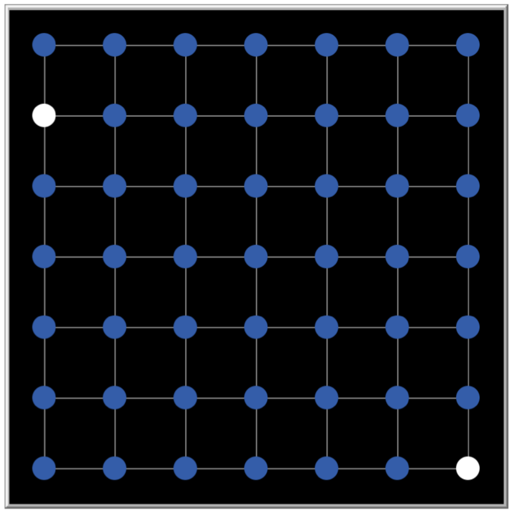
Examples and Figures

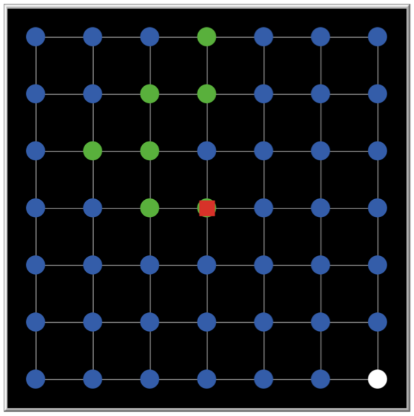


Example of a 9 by 9 maze, see exit points in white

Example 1

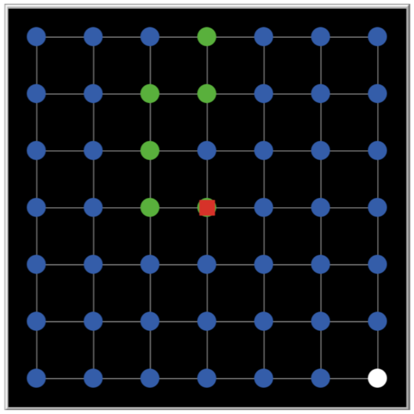
Example 2 is animated and can only be viewed online

With Loop



Path: (0,0), (-1,0) (-1,1) (2,1) (-1,1) (-1,2) (0,2) (0,3)

Without Loop

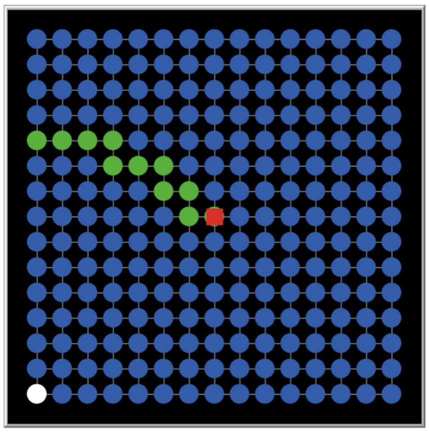


Path: (0,0), (-1,0) (-1,1) (-1,2) (0,2) (0,3)

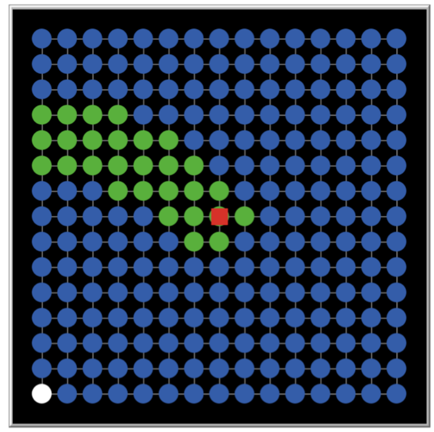
Example 3

Example 4 is animated and can only be viewed online

Figure 5

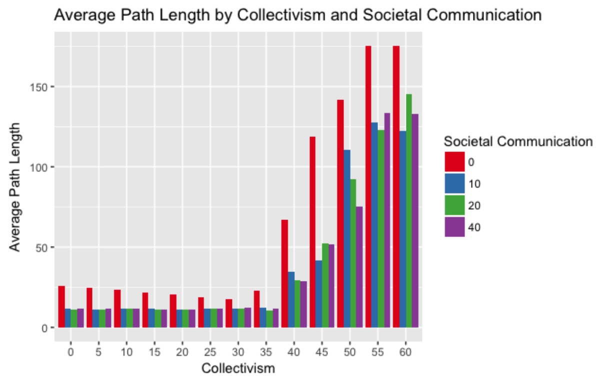


Example of a standard, in green

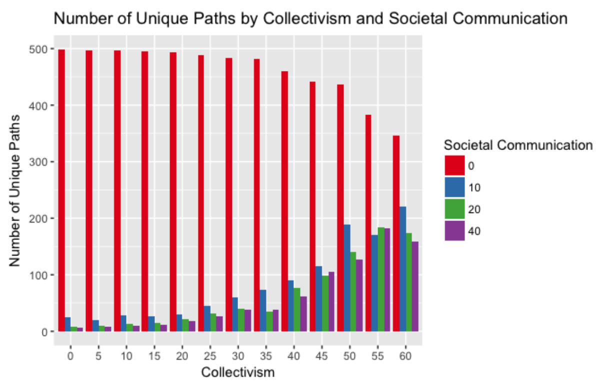


Example of the allowable spaces implied by that standard, in green

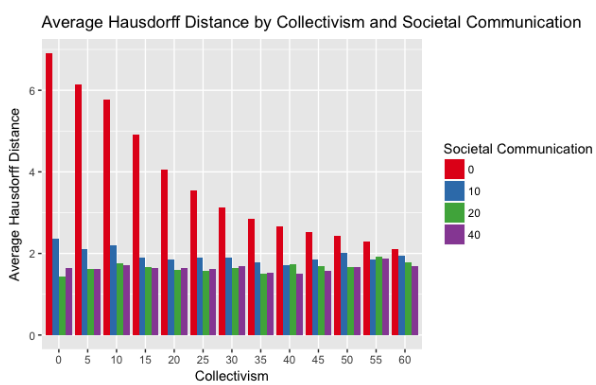
Example 5



((a)) Panel A

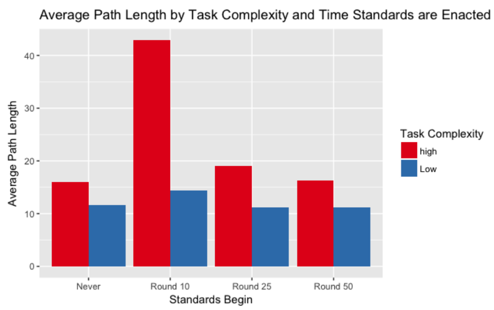


((b)) Panel B



((c)) Panel C

Figure 1: Collectivism and Societal Communication



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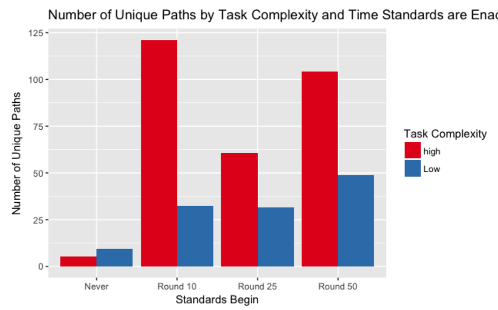

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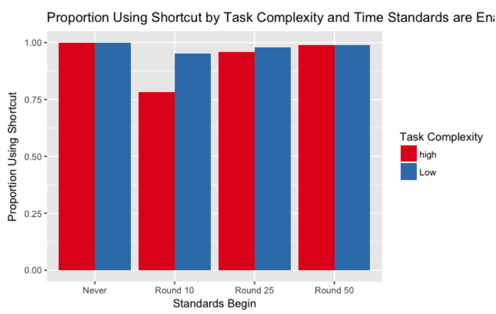

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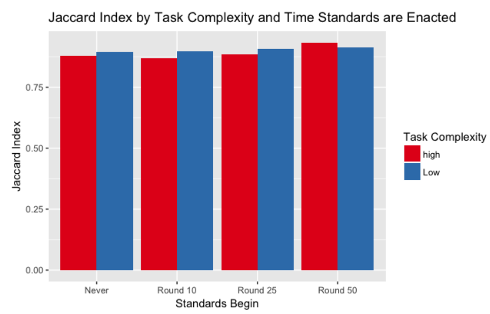

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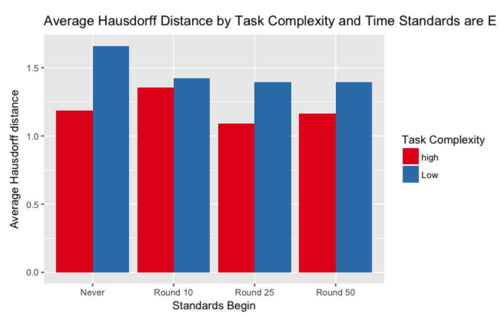
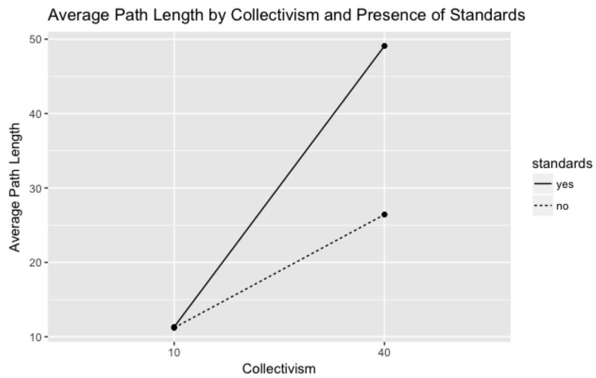


((e)) Panel E

Figure 2: Timing of Standards Introduction and Task Complexity



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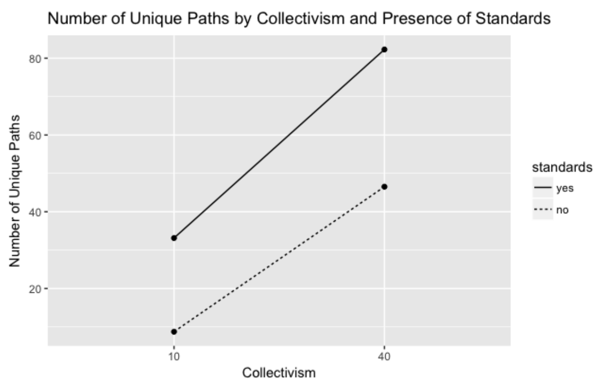

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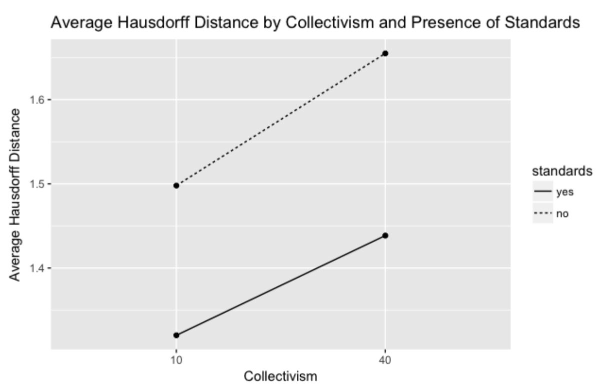

((c)) Panel C

Figure 3: Do Collectivism and Standards Solve the Same Problem?