Scenario Planning as a Tool for Choosing more Ethical Futures: a Case Study in Nanoscale Science and Technology

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Abstract—Nanoscale Science and Technology (NST), because of its incredible potential to alter the world we live in, has generated numerous reactions from scientists, engineers, investors, policy-makers, environmentalists, science-fiction writers, alarmists, techno-enthusiasts, and ethicists. In ethics, emphasis is placed on issues of control, access, associated risks, motives for developing the technology, cost/benefit, and potential societal, economical, environmental, ecclesiastical, educational, or political impact. Furthermore, a very few ethicists worry that NST might shake more fundamental definitions of self and other, as well as our relationship with our bodies or our natural environment. In order to better understand these ethical issues, this paper suggests the use of scenario planning (SP), an approach already widely utilized in strategy and decision making. Scenarios are systemic tools, which can help express, discuss, and evaluate different possible futures. SP takes a holistic view at the problem and involves numerous stakeholders with different viewpoints. In the end, SP provides a more transparent and democratic process for choosing the future. Moreover, SP can help unveil some previously unforeseen consequences of present decisions.

I. INTRODUCTION

Nanoscale Science and Technology\(^1\), because of its important economical potential, its distinct scientific properties, and its incredible capacity to completely alter the world we live in, has generated numerous responses by all the parties affected by its development. For researchers, one of the main concerns seems to be the issue of direction; where is nanotechnology headed? What will come out of it? The Drexler-Smalley debate [4] and the various conferences on the future of nano illustrate this anxiety. Meanwhile, some science fiction authors have denounced the catastrophic potential of NST through dystopias [1], [3]. In ethics, discussions of the future shape of NST, and even the notion of social and ethical implications are denounced. Indeed, as Lewenstein [8] argues, the idea of societal “implications” is deterministic in that it already assumes a future with nano, to which society has to comply. Other ethicists, such as Preston, offer the use of already known ethical frameworks to make an assessment of NST [12]. In one of her works on nanoethics, Berne divides the different ethical issues into three categories that she more appropriately names “dimensions” [2]. The first dimension of ethics is the most straightforward to grasp; it includes basic, agreed upon principles such as “avoid doing harm to persons or to the environment”. The second level poses questions such as: why are we developing nano? Who is developing nano? Who would have access to it? Who would have control of it? Who would benefit from it? Who might suffer from it? What would we be risking? How might nano impact our educational, political, ecclesiastical, or economical system? How would NST impact our privacy or our freedom? In other words, second dimension nanoethics can be portrayed as a roundtable debate, where all the different stakeholders expose their concerns about NST affecting their culture, identity, freedom, education, and other aspects of their life. Here, the stakeholders should be understood as individuals, as well as interest groups, corporations, NGOs, or governments.

The third dimension of nanoethics analyzes language and questions adopted notions. For example, NST is often associated with notions of ‘progress’ and ‘race’ (as in a race against other nations). What assumptions lie under the idea of progress? Are societal progress and technological progress identical? What does the ‘race’ metaphor imply? Who is racing? What is there to win? When is the finish line reached? Are there alternatives to the race metaphor?

As can be seen, second and third dimensions are deeply rooted in dialogue, narratives, language, and culture. What ethical approaches should be used to better understand and address these issues?

II. THE IMPORTANCE OF MORAL IMAGINATION IN ETHICS

In addition to ethical codes, guidelines, and other frameworks, some argue for the use of imagination as a path to ethical reflection:

“The quality of our moral understanding and deliberation depends crucially on the cultivation of our moral imagination” [7].

Much like Johnson, Berne argues for the use of “Imagination, Metaphor, and Science Fiction” [2] in discussing third dimension nanoethics. Although he later shows the limitations of science fiction (SF), Lopez does acknowledge that these stories lie at the core of NST [9]. In fact, it can be argued that narrative and metaphor both lie at the core of any scientific endeavor:

“Not only is no language, including mathematics, ever free of troping; not only is facticity always saturated by metaphoricity; but also, any sustained account of the world is dense with storytelling. ‘Reality’ is not compromised by
the pervasiveness of narrative; one gives up nothing except the illusion of epistemological transcendence, by attending closely to stories” [6].

It then seems perfectly natural to conclude that any objective and complete ethical analysis of NST has to challenge some of the metaphors and narratives at work in the NST initiative itself. One method of doing so, is for people concerned with ethics to write stories about NST, with the hope that some of the narratives, values, and concerns contained in these stories will permeate and challenge the larger set of narratives, values, and concerns already present in the NST circle. Moreover, these stories would offer a springboard for moral imagination, allowing the reader to contrast the imagined with the actual reality. Consequently, the reader would gain a more critical perspective on the current values fueled into the nanoscience and technology initiative. What might such stories look like? Ideally, these stories would be the result of a group deliberation, so that different stakeholders can express their perspectives. Moreover, in order to avoid any type of deterministic viewpoint, different stories contrasting one another should be created. Last, these stories should be as imaginative as possible, while also maintaining a relationship with the current reality. As we will now see, by adhering to these three properties, the stories would be entering the world of scenarios and their associated science, scenario planning (SP).

III. SCENARIOS AS PATHS TOWARDS MORE ETHICAL FUTURES

So far, we have justified the need for moral imagination in a complete ethical assessment of NST. From there, we have suggested that scenarios might be an appropriate approach for this task. In fact, due to their origins in strategy and long-term planning, scenarios are extremely centered on the various ramifications of decisions. In other words, scenarios are meant to stimulate the thinking of the stakeholders. As such, scenarios are an ideal tool for igniting moral imagination. Furthermore, SP can avoid the deterministic pitfall provided that the futures it offers differ enough from one another. For instance, to avoid technological determinism, at least one of the scenarios would have to consider a world without (a particular) technology. Another trait of scenarios lies in their community-centered and systemic aspect. Scenarios originate from intensive debate between several stakeholders in a given community. In doing so, the stories become more than a tool for reflection; they are a proactive methodology for building a “better” future.

“Finally, scenario planning offers roles to different individuals to contribute their unique perspectives to the shaping of communal creativity. There is a role for individuals in the communal practice of scenario planning. Scenario planning provides a medium for sorting our hopes and fears, and hence, a medium for investing our plans with our values. Because scenario planning allows for groups of people to deliberate collectively over the possible consequences of their collective choices, scenario planning turns out to be a medium for collectively choosing courses toward better futures” [11].

While the notion of “better future” is very difficult to define, as a systemic approach, scenarios can bring us the following benefits:

- transparency of the values fueled in our vision of the future
- involvement of the community at large
- a larger perspective on the issue, which can help us avoid previously unseen and undesirable consequences
- a proactive, responsible stance regarding the future

In short, scenarios can help us complete an ethical assessment of NST, as well as evaluate potential futures and their consequences on society. In the next section, we try to give the reader a more concrete idea of what scenarios are.

IV. SCENARIO EXAMPLES

At this point, it is reasonable to wonder how scenarios actually function. Below, the reader will find a few straightforward examples. As for the actual methodology, it will be the topic of a future paper. For now, we will refer the reader to the work done by P. Wack, P. Schwartz, K. Van der Heijden, and other experts in the field.

In a 1995 special edition of Wired, GBN co-founder Lawrence Wilkinson wrote an article entitled “How to build scenarios” [15]. In this piece of writing, the following question was asked: “What will be the general tenor of commercial life on a global scale in the year 2020?” Four different scenarios were given. The first one, nicknamed “I will”, goes like this:

“The world fragments into a working pandemonium of individuals, organized by jobs rather than geography. Communication is pervasive and focuses on personal empowerment. The Net becomes the chief exchange medium for decentralized work, personal gratification, and global commerce. Physical infrastructure in North America stagnates, while personal spaces thrive. Art and attention are turned inward, as personal expression flourishes in new

2 In this context, I understand technological determinism to be the idea that technology evolves at least partially outside of human control, and that its “evolution” cannot, or at least should not, be stopped.
media and old public spaces crumble. Technology is the global culture. The have-nots become the have-lates. Ethnic or group differences give way to a homogenized patchwork of unbridled individual variety. Europe is wracked with civil strife as its socialist civilization unravels. Russia rebounds. Japan lags. China and the developing countries become huge flea markets where just about anything goes”.

Although Wilkinson purposely simplified scenario planning and the scenarios themselves, the stories do not necessarily have to be longer or more detailed than what is illustrated above. In fact, too much detail or length might impair the stakeholder group from understanding the big picture, which in turn would hold back their reflection on the implications of the scenario.

Also in an issue of Wired, Garreau summarizes the Mont Fleur scenarios, which came from a South African attempt, in the ‘90s, to steer the nation towards a multicultural democracy. The most pessimistic of the four stories went like this:

“If the white power structure just stuck its head in the sand - did not face the world economic and political isolation, did not deal with internal black unrest except by repression, and did not conduct negotiations with the majority - the result would be massive internal resistance, international condemnation, violence, flight of capital and skills, and economic deterioration. Then things would get really ugly”.

On the opposite end, we have the “Flight of the Flamingos Scenario”:

“Flamingos take off slowly, but fly high and together. In this scenario, negotiations and a quick transition lead to effective, sustainable, clean, inclusive government, generating the economic growth that allows social problems to be addressed. Everyone lives happily ever after”.

The reader should now have a more precise idea of what a business-oriented or regulatory type scenario might look like. Yet, she/he is now entitled to wonder how these scenarios might be formulated in terms of NST. David Rejeski [13] and Ahson Wardak [14], who worked together at the Woodrow Wilson International Center for Scholars, have done just that. In the first of the four scenarios he presented (“Tipping Scales”), Rejeski talked about “evidence of negative environmental and health impacts from nanotechnology”, amplified risks, insufficiency of regulatory measures, and public distrust in the governmental responses. Wardak’s first scenario (“The world is flat”) describes a future in which US NST regulations are restrictive, while most of the science and technology work is being off-shored. As a result, in this scenario, the US does not benefit from the economical advantages of developing NST, while still at risk of a catastrophe (since a NST incident in India or China could potentially affect the entire planet).

Rejeski’s and Wardak’s research has made important contributions in NST policy-making. In order to follow their path and focus even more strongly on the ethical and societal issues, it is important to take the following points into consideration when building scenarios. First, in order to avoid technological determinism, at least one of the scenarios should assume a world without NST. Second, scenarios similar to Wardak’s and Rejeski’s can be used, but with even greater emphasis on the implications of the stories. For example, in “The World is Flat” scenario, one should wonder how the lives of our citizens are affected, or how the educational system would respond to a lack of interest in the sciences. One should also question the assumptions of such a scenario; would the developed countries really be less secure if new technologies were developed and produced by thousands of miles away? Would it be a scenario that society would avoid on the sole basis of a potential economic disadvantage? Could we conceive of a very similar scenario with a global entity regulating NST across all nations? How would developing NST in Asia impact the values fueled into the technologies? How would this geographical and cultural shift impact other aspects of our lives? Would this shift in technology balance out the current political power structure? In other words, would western countries lose some of their political, cultural, and military influence, while eastern countries instead gain this influence?

V. CONCLUSION

As we have seen, scenarios are powerful tools when it comes to using our moral imagination and understanding the consequences of our decisions. The biggest strength of scenarios, in my opinion, is their ability to provide a common language to people from different educational, technical, and ideological backgrounds. As a result, the tomorrows that we shape can become more democratic and transparent, while also avoiding mistakes that might harm us all. We are well aware that a single normative scenario cannot be agreed upon because people have different values. Nevertheless, this is not to say that a range of better, more ethical, futures are impossible. In fact, the claim that we cannot as a society agree on all values does not invalidate the fact that we can (and do) agree on some values. Thus, scenarios can allow us to direct ourselves towards futures that we, as a society, believe ought to happen.

Although scenarios can be a powerful tool in ethics, it is important to keep in mind that they are not a solution in and of themselves. In fact, scenarios can only complement other frameworks; they are not here to replace any other efforts to assess societal and ethical issues related to NST. Furthermore, the scenario planning community is still growing and scenarios are a relatively new endeavor. Consequently, SP still has a long way to go, and the field still lacks in diversity [5], which might harm its ability to create a better future for itself. Last, some might dismiss SP as too idealistic. Admittedly, no stakeholder group can ever be truly representative of society as a whole, while a same scenario might be understood differently and at different
levels by the various members of that group.

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