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Legislation Blowing in the Wind

With visions of Hurricane Katrina dancing in their heads, many Members of Congress wanted to immediately push some kind of legislation that would save American lives in future disasters, but how? Disaster response is a complex matter. Katrina, like any problem that dominates the American news, produces a deluge of proposed "quick fixes" to be evaluated by Congress. When proposals involve science or technology, this can be difficult.

One problem Congress could address in the aftermath of Katrina is the wireless communications systems used by firefighters, paramedics, National Guardsmen, and other emergency responders. Search and rescue efforts often were crippled by failures in these systems. Some will now push for grants to local governments to improve technical "interoperability," i.e. the ability of responders in one agency to communicate with responders in another agency. After all, interoperability failures cost lives on 9/11 [1], after Katrina, and on too many other occasions [2]. Others will push to take spectrum away from television broadcasters, because a portion of this spectrum would go to public safety. After all, there is good reason to fear that a dangerous shortage of public safety spectrum is coming [3]. However, the decisions are not simple. One company after another will tell Congressional staff of their alleged "solution" to interoperability problems, if government agencies would only purchase their products. Other companies will describe how the release of television spectrum in the manner they propose would be the salvation of public safety, and by coincidence, the proposed change also will affect their commercial systems in subtle but important ways. It is hard for someone without technical expertise to make sense of all these claims. Worse yet, changes may have side effects. Some plans intended to make more spectrum available to public safety would accidentally create new interoperability problems, and some plans intended to improve interoperability would accidentally exacerbate a spectrum shortage [4]. Moreover, in preparing communications systems for the next hurricane, some issues could be even more important than either interoperability or a potential spectrum shortage, but no one successfully has brought these issues to the attention of Congress. There may be no one with sufficient incentive to do so.

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There is nothing unique about this drama. This year, almost every committee in Congress will face one or more issues that are similarly hard to disentangle without expertise in some area of science or technology. This includes issues related to energy, the environment, health care, food safety, national defense, homeland security, space exploration, intellectual property, transportation, and telecommunications, just to name a few. The majority of these typically are not labeled as "science issues," and most do not go through the Science Committee.

Plenty of Input, Not Enough Clarity

Congress relies primarily on adversarial procedures that are honed for equitably setting priorities, in contrast with the very different forums of scientists, which are honed for advancing knowledge [5,6]. Congress must answer questions like 'is it more important to reduce the cost of automobiles or to reduce gasoline consumption?' and 'is it better to increase taxes or to cut programs?' Stakeholders from all sides of a debate make their case. Members of Congress, acting as representatives of their constituents rather than experts in any narrow discipline, then adopt a position based on their own values and priorities. Debates continue until consensus emerges for a compromise between competing interests. All of this works well if Members of Congress have a clear understanding of the issues and tradeoffs. Understanding can be extremely difficult when issues are rooted in science or technology. Indeed, it can be hard for someone with no technical expertise to ask the right questions. Thus, as shown by the above example of communications systems for public safety, Congress may need assistance in framing and prioritizing the fundamental problems, identifying the legislative options, assessing advantages and disadvantages of each option, and calling attention to any unintended side effects. With this information, Members of Congress of all political persuasions can apply their own values, and make informed decisions. Unfortunately, Congress has no reliable source for this kind of assistance on technical issues.

This does not mean Congress has no information. Indeed, Capitol Hill is overflowing with lobbyists who are prepared to tell Members of Congress how to vote and why. While input from stakeholders and their representatives is essential, it clearly is no substitute for the kind of impartial assessment described above. Members of Congress also can turn to a cadre of dedicated and intelligent staff. However, given the tremendous range of issues that Congress must address, most Congressional staff are generalists whose primary expertise is the legislative process, rather than any scientific discipline. Alternatively, Members of Congress can seek advice from one of their support organizations: the Congressional Research Service (CRS), the Congressional Budget Office (CBO), or the Government Accountability Office (GAO). While each of these organizations plays an important role, and all are in a good position to understand Congressional needs, the detailed assessment of technical issues simply is not part of their historical mission, so they traditionally have not built staff expertise, institutional mechanisms, or credibility in this area [7]. Of course, Congress may be changing that tradition—an option that will be discussed later.

Another important source of information on issues related to science and technology is the executive-branch agencies, many of which have significant expertise. However, the U.S. system is based on checks and balances, and Congress is obligated to oversee the activities of the

executive branch. Meaningful oversight is impossible without independent expertise. For example, Congress cannot oversee the nation's finances if they depended entirely on the White House for analysis, which is why Congress has a Congressional Budget Office that is completely independent of the White House Office of Management and Budget. Unfortunately, on matters related to science and technology, Congress has no comparable support.

There still are more sources of information outside of government. These tend to be inappropriate for different reasons. The National Academies sometimes are an excellent resource for Congress [8[, but for a different purpose. The National Academies generally attempt to bring diverse experts together to produce a consensus recommendation about what Congress should do. In many cases, Members of Congress do not want to be told what to do. Instead, they want a trustworthy assessment of their options, with the pros and cons of each, so they can make up their own minds. Universities and research institutes also produce valuable work on some important issues, but it rarely is generated at a time when Congress most needs it, or in a format that the overworked generalists of Congress can readily understand and apply. Moreover, Members of Congress must be suspicious that the authors of any externally produced report have an undisclosed agenda.

In short, there is a fundamental gap in the information available to Congress. There is no consistent source of in-depth assessments that are balanced, complete, impartial, and produced at a time and in a format that is sensitive to the specific needs of Congress [9]. CRS reports are sensitive to Congressional needs and are designed to be impartial, but, by design, are limited in scope and depth. Partisan input also can be sensitive to the needs of Congress, but it is never impartial. Other information produced outside of Congress tends to be far less sensitive to Congressional needs, and the majority of it advocates for particular positions rather than merely providing a baseline assessment.

The Controversial History of Technology Assessment

There have been notable attempts to fill this gap. The flagship solution was the Office of Technology Assessment (OTA), a stand-alone organization that worked specifically for Congress, like CRS, CBO, and GAO. OTA produced roughly 750 reports during its 23-year lifespan, many of which were rigorous, respected, and widely cited by both supporters and opponents of the controversial measures that these reports addressed. Using OTA as a model, many nations have created similar organizations to advise their national legislatures [10]. While OTA had its supporters, it also had some severe critics, and this would ultimately be the organization's undoing. When Republicans took control of the House of Representatives in 1995 after four decades in the minority, they eliminated OTA.

Some of the reasons for eliminating OTA had little to do with its effectiveness. While the Republicans were in the minority, they often had called for the elimination of various government programs and agencies. When they became the majority party in the House, they were under great pressure to follow though on these promises, but it was not easy to eliminate big targets like the Department of Education. Ultimately, they would succeed in eliminating exactly one agency—OTA—giving it great symbolic importance.

Nevertheless, the debate over OTA was not all symbolism. Some Members of Congress raised noteworthy concerns. The most serious allegation was bias. It is not surprising that the party in the minority (before 1995) would raise concerns about bias, given that the other party had dominated Congress throughout OTA's existence. For example, some conservatives claimed bias in a series of OTA reports that questioned the technical feasibility of the Strategic Defense Initiative (SDI) (dubbed "Star Wars" in the press) [11-14]. SDI was intended to shield America from incoming missiles. To the horror of then-President Ronald Reagan and his supporters in Congress, OTA concluded that the SDI vision of protecting all Americans from Soviet missiles was "impossible to achieve." [12]

Two decades later, the debate continues over whether OTA was biased, but this debate is largely irrelevant. Regardless of whether the bias concern was rooted in reality, appearance, or fabrication, the lessons are the same. Bias or the appearance of bias can be devastating. An organization designed to serve Congress must be both responsive and useful to the minority, as well as the majority. Representatives of both parties and both houses must provide careful oversight, so that credit or blame for the organization's professionalism is shared by all.

The most likely way for bias to arise is in the selection of issues to be investigated. Consequently, both parties and both houses must have significant say in this selection. Shared oversight can prevent a pattern of bias across many issues, but if an unbiased organization is doing its job well, there still will be individual reports that anger one group within Congress. As long as there was no bias in the selection of topics, all reports will not displease the same group. Consequently, the organization must be constructed in such a way that the furor over any one or two controversial issues is likely to die down before angry partisans can eliminate the agency. For example, funding and staff levels might be fixed four years ahead of time, instead of just one year.

Probably the most frequent criticism of OTA from supporters and detractors alike is that it was too slow; some studies took so long that important decisions already were made when the relevant reports were released. Many have argued that any future organization must be faster. This may be the case, but there are more important lessons here. Good work takes time, particularly if Congress is expecting a broad scope, and extensive depth. However, this is not always the case. Sometimes a Congressional Committee happily will accept a narrow scope or a significant amount of recycled content, if the report is available quickly. The most important lessons here are that an organization providing technology assessments must offer Congress a wider range of services with varying durations and scopes, and that it must be part of this organization's culture to listen carefully to its client (Congress) to understand the client's preferences for any given project.

A New Era for Technology Assessment

In June 2001, six years after OTA's demise, Carnegie Mellon University organized a workshop in Washington, D.C. on the state of science and technology information in Congress. The workshop drew leaders from both the scientific community and from Congress. Speakers

from Congress included Representatives Sherwood Boehlert (R-NY), Vernon Ehlers (R-MI), Rush Holt (D-NJ), and Amo Houghton (R-NY). There was remarkably strong consensus that Congress needed new institutional support to provide advice on issues related to science and technology, although opinions differed on the ideal form of this support. Some preferred a return to the OTA model, and others preferred something quite different.

Six distinct approaches are discussed in detail in *Science and Technology Advice for Congress* [15], a book produced by many workshop participants. Two difficult questions divide many of these models: (1) should this technology assessment capability reside in an existing organization or a new organization, and (2) should its staff work directly for Congress or should there be institutional separation?

The problem with creating a new technology assessment capability and placing it in an existing organization, whether it is CRS or the National Academies, is that these organizations already have their own missions and their own cultures, which are not perfectly compatible with the technology assessment process. This clash can make it more difficult to do high-quality technology assessments. Moreover, if these assessments are viewed internally as a diversion from the organization's real mission, there is a danger that some important resources (e.g. staff, funding) will be directed elsewhere when budgets are tight. On the other hand, if this new program is a division of an existing organization, there may be more opportunities to share scarce resources and expertise. Moreover, judging from the OTA experience, a stand-alone organization may be more vulnerable to complete elimination during heated controversies.

With regard to the second question of "distance" from Congress, some advocated that technology assessments be conducted within an organization that answers directly to Congress (i.e. GAO, CRS, CBO), or a new organization that is similarly constructed. Others wanted an organization (new or existing) that operates under contract to Congress, and perhaps to other clients as well, as the National Academies do today. The former would encourage staff to be more sensitive to the needs of Congress. It also could afford them less protection when bringing news that Members of Congress do not want to hear. Moreover, the staff size of a Congressional organization is always limited, making it difficult for this organization to have expertise in every topic of potential interest to Congress. By contracting work to outside organizations, talent can be drawn from a much larger pool. This issue becomes particularly important if the technology assessment effort is relatively small.

Given these tradeoffs, my proposal would create a hybrid, in which a small dedicated staff work on Capitol Hill directly for Congress [16]. Their job is to understand the needs of Congress, and to insure that all reports in their final form meet those requirements. However, much of the assessment work would be done by a collection of outside organizations, each of which would be certified every few years for competence, professionalism, and impartiality.

After the workshop, Senator Jeff Bingaman (D-NM) proposed the creation of a small pilot program in technology assessment. Thanks to bipartisan support in both the House and Senate, the pilot received $500,000 of funding in the 2002 budget. Work began in March 2002, and GAO's first assessment on biometric technology for border security came out in November 2002 [17]. This was remarkably fast turn-around, especially given that GAO had no institutional

experience with this kind of analysis. GAO also invited an external evaluation of their work from outside experts [18], which demonstrates seriousness about quality. (Most agencies avoid criticism rather than seek it). Other GAO technology assessments have followed [19,20].)

Early results are quite encouraging. Experience to date shows that a technology assessment program operating within GAO is capable of producing balanced, timely, and relevant reports containing a range of useful information on important issues before Congress. Not surprisingly, early results also show that improvement is possible and desirable, in large part because technology assessments differ substantially from the traditional GAO studies in intent, content, and process. Thus, for example, GAO must learn new methods of soliciting input from outside experts, framing a technology assessment, and subjecting work to fast but effective peer review. If Congress keeps funding this pilot, it is likely that GAO will continue to improve with experience.

This small pilot will do some useful work, and foreshadow the effectiveness of a program within GAO before making longer-term decisions. However, the GAO pilot cannot succeed in the long run if it remains a mere pilot. A technology assessment program must develop or recruit a staff that has strong credentials to impress both the scientific and Congressional communities, and significant expertise in science or technology, in communicating with Congress, and in technology assessment. Attracting, developing, and retaining outstanding people with these diverse skills will not be easy for a program that could abruptly cease to exist with little warning.

Worse yet, should a technology assessment ever produce news that is unwelcome to any powerful group within Congress, there is little to protect the program from termination. Since management within GAO knows this, they might be tempted to avoid controversial issues, or worse yet, to dilute the conclusions of experts and staff members. If they succumb to this temptation, the program will be of limited effectiveness, and if they do not, the program will not survive for long.

Conclusion

When issues are rooted in science or technology, Members of Congress often need assistance in framing issues, identifying legislative options, and assessing all the pros and cons of each option, so they can make informed decisions that are consistent with their own values and priorities. Today, Congress has no reliable, impartial source available to provide detailed analysis of this type, with the possible exception of a limited pilot effort within GAO. It is time for Congress to move beyond pilots, and to establish a permanent technology assessment capability. When creating a permanent solution, the greatest challenges will be to ensure that this new technology assessment program has careful and balanced bipartisan and bicameral oversight, and that its staff and funding levels will remain stable, even through heated controversies and budget crises. Ideally, they should receive sufficient resources to offer a significant amount of support for Congress, but stability is more important than size.

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