

Using Firefighting as a Case Study for Technical and Social Cooperation

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

As noted in a report by the National Fire Protection Agency (NFPA), the total monetary loss incurred due to fire in the U.S. in the past year amounts to \$25.6 billion (2019, pg. 10). Large expenditures are always difficult for governments to handle, and often the sheer expense of fully staffed professional fire departments forces smaller local governments to rely heavily on their volunteers. However, according to NFPA estimates, outlined in their semi-annual fire department report for 2019, the number of volunteer firefighters is at 680,000 nationwide, down from nearly 800,000 in 2015 (pg. 4). This apparent lack of engagement in such a critical service should be cause for concern for any community, especially ones located in areas with a greater propensity for fires. Research done by Linardi and McConnell (2011) may be cause for further alarm, as they discovered that the number of people who decide to leave an organization grows once others have been seen to leave. As shown below in Figure 1, the reality is that firefighters do much more than fight fires. In fact, they perform several integral services, without which many

would suffer greatly.

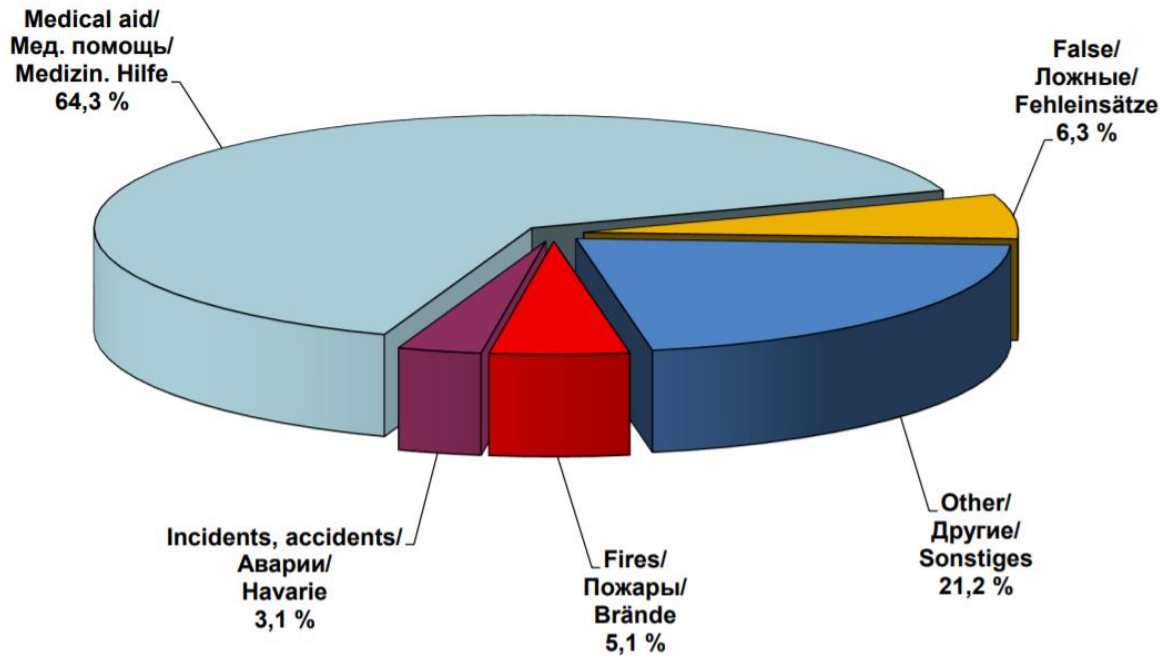


Fig. 5: Type of fire service calls
Рис. 5: Структура выездов пожарных подразделений
Bild 5: Einsatzstruktur der Feuerwehren

Figure 1: *An overview of the emergencies firefighters around the world responded to (CTIF, 2019, pg. 37)*

To stem the tide and halt the exodus from volunteer departments, communities need to act quickly to remedy the difficulties that plague volunteers. Smith et al. (2019) noted that firefighting activities induced marked increases in inflammatory responses, which can lead to cardiac arrest – a malady which accounts for nearly 50% of all line-of-duty deaths among firefighters (p. 617). While it is possible for a group of individuals to ignore the risk of death in the pursuit of a larger goal, they must be confident and satisfied in their work. Unfortunately, according to Henderson and Sowa (2019), “(the) understanding of volunteer satisfaction in public safety services is, at present, underdeveloped” (pg. 3).

In this paper I argue that the decline of the American volunteer firefighter is a useful case study in the pursuit of a deeper understanding of the dynamics between technology and culture, specifically as they relate to volunteering. There are numerous approaches different communities take towards the development and expansion of these departments., and the results reflect this disparity in method.

Part I: The Dichotomy Between Volunteer and Non-Volunteer Departments and How It Relates to Technology and Culture

The relationship between technology and culture is relatively new in terms of human history, but nevertheless has been explored with surprising depth and nuance by a number of authors. Bruno Latour made short work of connecting technology to actors as commonly considered in the human sense of the term, and Leidner and Kayworth (2006) laid some of the groundwork for a theory relating information technology and culture. However, few have examined the connection between these two in the context of a specific field or vocation.

Indeed, one of the vocations in which this fascinating relationship can be studied is that of the firefighter. An interesting thing about American firefighting in particular is how stark the differences are between it and other firefighting approaches in other nations. Arguably, these differences are the very things that make firefighting, and volunteer firefighting in particular, a microcosm of the interplay between culture and technology. As outlined below in Figure 1, this doesn't necessarily paint a rosy picture.

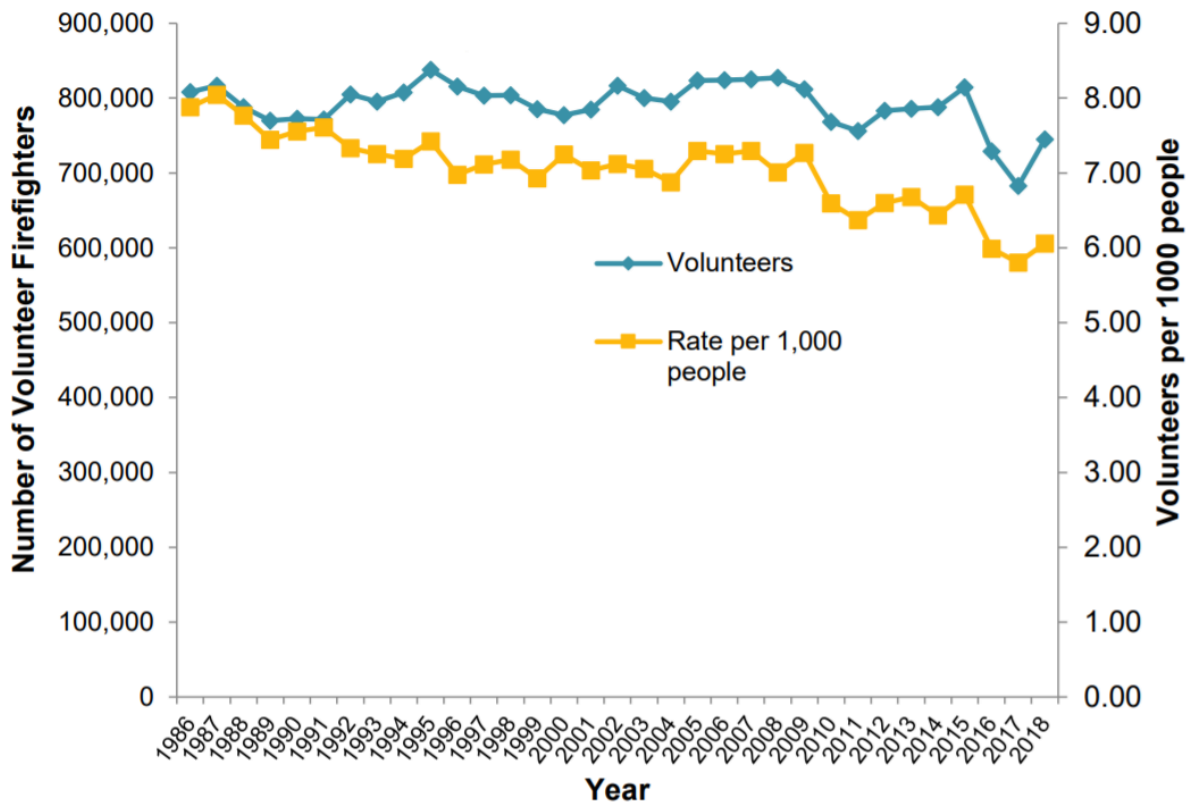


Figure 1: *The number of volunteer firefighters per 1000 people (NFPA, 2019, pg. 4)*

In general, the number of volunteer firefighters in the United States is on the decline according to recent statistics. Unlike several other countries, the United States has chosen to implement a system that attempts to balance the number of paid and volunteer firefighters. Although this system is essentially based on allowing states to make their own decisions regarding volunteer and paid departments, the end result is relative balance, at least on the national scale. According to FEMA statistics from 2020, a little over half of all firefighters in the U.S. are volunteers (pg. 4).

The relative balance that exists in the number of volunteer and professional or semi-professional firefighters that is present in the U.S. does not hold internationally, however. In fact, several countries such as Spain, France, and Brazil put far more emphasis on professional (sometimes even military) firefighting organizations. On the other hand, nations like Belgium, the Czech Republic, Finland, and Croatia put much more emphasis on volunteer firefighting, with volunteers dwarfing the number of professional firefighters the nation has on hand.

These differences merely scratch the surface. Within the United States itself, there are actually notable differences in approach from a state-wide perspective. It turns out that states with a lower population and wider areas tend to rely more heavily on volunteer departments, rather than the more populated states which, as a rule, tend to utilize professional departments. As shown in Figure 2 (below), among states that rely almost entirely on volunteer departments, the vast majority have relatively low population density, as compared to other states within the US. The only notable exceptions (Delaware and New York) are north-eastern states, which have relatively few fire departments compared to other regions within the U.S.

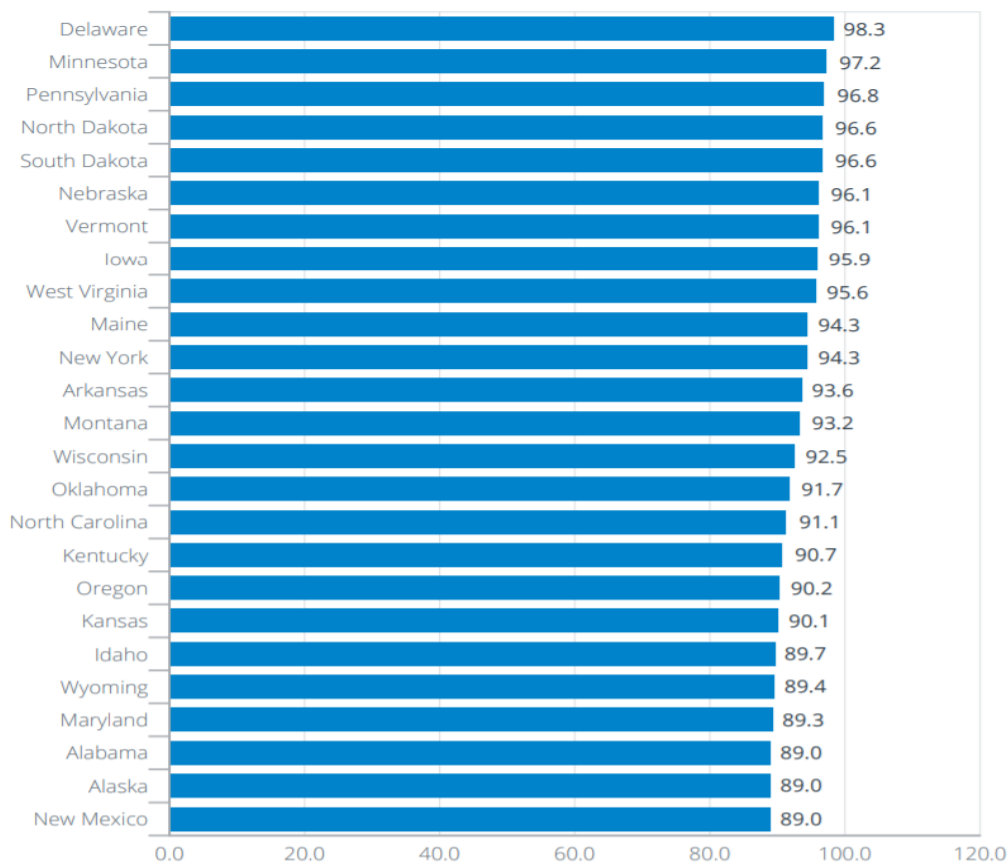


Figure 2: *Percentage registered volunteer/mostly volunteer departments by rank (FEMA, 2020, pg. 6)*

Parallels between population density and the complexity of the technology available to the department can also be made. Communities that have greater resources tend to spend more on the development and maintenance of their first responders than those with lesser resources. The reality is that these differences between volunteer and professional are really the key which will allow a careful observer to unlock new perspectives from which to approach the complex duo of culture and technology.

Part II: Pacey’s Innovative Dialogue and Actor Network Theory Applied to Volunteer and Professional Firefighting

In order to approach the apparent divide between volunteer and professional firefighting from a critical standpoint, I use a combination of actor-network theory (ANT) and some of the thoughts of Arnold Pacey as a framework from which to extrapolate useful information from the plight of the volunteer firefighter in the United States. As Pacey indicates in “Innovative Dialogue,” it is sometimes easy for governmental or corporate bureaucracies to make technological progress in a linear sense (p. 137). That is, with a single goal in mind and definite progression towards the goal, typically utilizing only a limited portion of the technology that could be brought to bear to achieve the desired end.

One of the very first examples that Pacey utilizes to show how bureaucracies can hold up innovation is the case of NASA, which spent much on the development of non-solar power for satellites, resulting in exponential costs that could have been easily avoided if the possibility of solar power had been considered seriously (pgs. 138-139). Similarly, there is a plethora of evidence indicating that many departments, beholden to their local bureaucracies, have seen their technological development stymied for no reason other than a lack of innovation. Such stagnation is made more obvious when the department in question doesn't have the funding necessary to cover up their non-innovative solutions to difficulties.

Another of the perspectives that Pacey brings to the table in the case of a nationwide organization is the view on the collaboration between organizations that typically do not emphasize innovation. In his case, the United Kingdom's Energy Department had little use for investment or development in industrial wind power. Foreign departments and corporations were able to then develop these enhancements for wind power in a relatively unimpeded manner, which allowed them to acquire key investments and overall increase their sales (pg. 142). Focusing on the development of innovative ideas perhaps initialized by others could provide a

useful line of analysis into the success and failure of fire departments both at the national and the state-wide level.

Applying Pacey's insights with Actor-Network Theory to Firefighting

Bringing the views that Pacey eloquently defended and applying them to the situation firefighting in the United States finds itself in would be a monumental task without the help of actor-network theory (ANT). Actor-network theory has proven to be unparalleled in delivering strong outlines of a given socio-technical system, which takes into consideration all of the possible aspects the given situation could entail. As illustrated in Figure 3 (below), the combination of both Pacey and ANT can provide a strong approach which can then be utilized in order to come to a better understanding of a given problem.

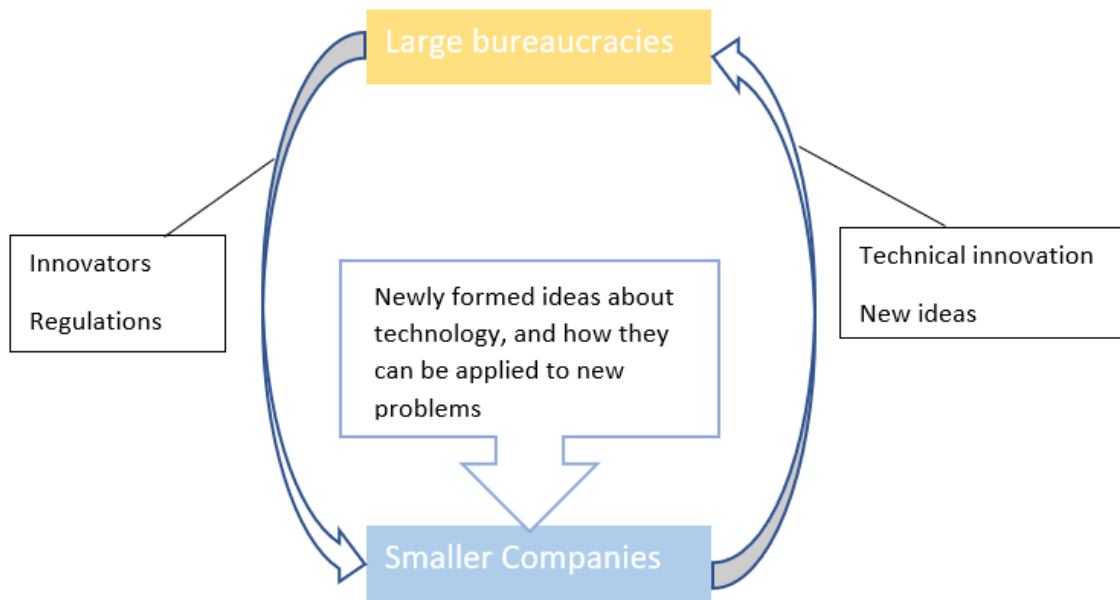


Figure 3: *Pacey's adapted insights into innovative dialogue, in the perspective of actor-network theory, synthesized into a general overview (created by author).*

The technical and organizational aspects of firefighting in the United States seem to fit well into the innovative dialogue that Pacey outlines in his book. A clear parallel can be drawn between the larger professional firefighting departments and the (generally) smaller volunteer departments which must consistently innovate in order to survive. The comparisons do not end there however. Much of the communication between different groups within local and general leadership can be characterized by what Pacey calls “dialogue at many levels,” something critical in order to “stimulate innovation” within a given system (pg. 157). Such an increase in dialogue can be further facilitated should the flow of information between volunteer and paid departments continue to increase.

Part III: The Case for Balancing Volunteer and Paid Departments within a Given Nation

Neither the volunteer firefighters nor the professionals have significantly differing goals within a sociotechnical system. This is evidenced by the fact that while professional departments tend to pay their firefighters a noticeably larger amount of money, the primary difference between these two types of departments is the amount of resources that goes into their support and development. As shown below in Figure 4, there are quite a few central actors (in the sense of actor-network theory) that are shared between both volunteers and professionals.

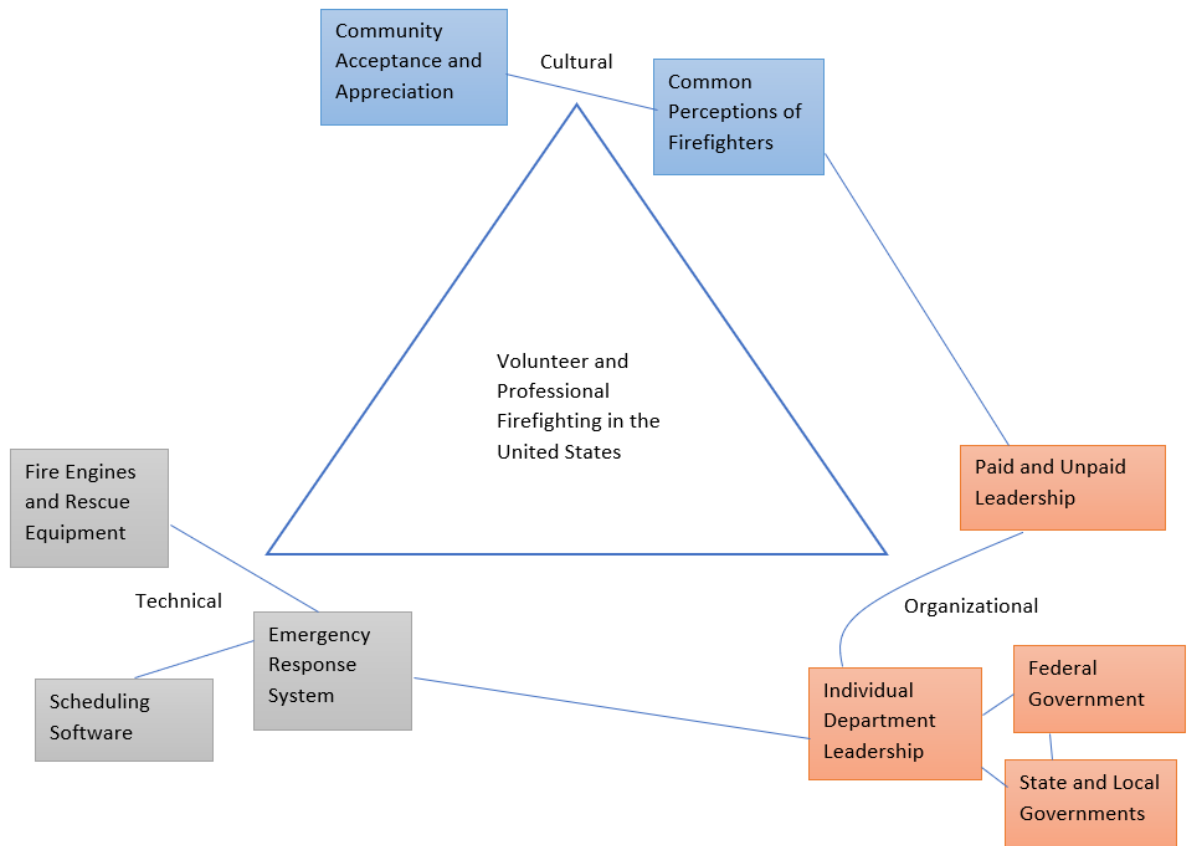


Figure 4: *An actor-network theory visualization of some central aspects of both volunteer and paid departments (created by author).*

Few, if any of the nations mentioned previously (France, Spain, etc.) have either the land-mass or the population which could make even remote comparisons to the gigantic size of the United States. The consideration of these characteristics is integral when analyzing their choices with regard to volunteer or paid firefighting. Belgium, for example, relies almost entirely on volunteers to provide fire rescue services to their relatively small population. Giving the firefighting situation in a country like the Netherlands more than a cursory glance reveals that a very similar situation has developed. According to a report published by Comité Technique International de la prévention et d'extinction de Feu (CTIF), the Dutch rely heavily on volunteer

departments to protect their country with nearly 12,000 volunteers as opposed to 5,000 professionals (pg. 41, 2019). The CTIF publication goes on to note that the professional firefighters are regularly employed to serve the larger cities within the country, while the volunteers work for the smaller communities.

Unfortunately, there are problems with relying heavily on one type of service over another. Germany is without a doubt the nation that serves as a bit of an outlier to much of the data given by the CTIF. Although Germany is one of the largest countries in the European Union, the vast majority of their firefighters are volunteers (nearly 95%) with only a few non-volunteer departments even existing (CTIF, 2019). However, recent reports indicate that (like in the United States) the number of their firefighters tends to be on the decline.

Few would dispute the efficacy of volunteer departments when serving larger areas with population densities not reaching the critical mass at which point the funding and upkeep of a regular department becomes feasible for the community. However, it seems as though in firefighting, as with technology, far too little care has been taken to ensure that the end outcome (either strong fire departments, or beneficial technology) is actually the end that is achieved. German cities are indeed the ones who have taken some initiative, forming professional departments (at least in name) in order to have a failsafe should their local volunteers be stretched too thin to respond to an emergency. However, such an approach mirrors the apathy those responsible for the well-being of the citizens of New Orleans prior to the disastrous flood had towards the possibility of increasing the level of safety in the area.

The reason for heavy German dependance on volunteer departments is that after the war, the militarized fire services that once served Germany were disbanded. With a sudden lack of

professional fire departments, the number of volunteers swelled. Despite the later return of professional firefighting services, the volunteers remained the largest firefighting group within the country. While in the United States, there is little historical precedent for such a drastic shift, perhaps resulting in the relative balance that can be seen today, it cannot be ignored that moderation is paramount when employing large amounts of either volunteers or professionals in the service of their communities. The needs and requirements that are associated with different countries and different socio-technical situations are hugely varied, and attempting to force one solution on all of these is a doomed effort from the start. Ensuring that these needs are met in a timely and efficient manner is a herculean task, but one that should be taken very seriously. Indeed, a more careful selection of both the laws and the socio-technical systems that form as a result would lead to more desirable results for all. The link between volunteer firefighters and society is hardly deniable, as these volunteers are, as it were, part of the very fabric of society. Despite this, it seems that perhaps a more healthy balance between volunteer and professional departments would be the correct choice for a nation like Germany, with the many industrial centers and population-dense regions covering significant portions of the country.

Conclusion

In general, whenever socio-technical systems come into play, the complexity that is innate within human beings must necessarily come out. Unfortunately, the socio-technical system that drives firefighting both within the United States and in the world as a whole is no exception. One layer of this complexity is actually that which is indicated by the increasingly byzantine communication networks that many volunteer firefighters rely on for communication. Perhaps as a result of less than talented local leadership, or perhaps due to the lack of funding,

volunteer fire departments face many challenges that the professional departments do not necessarily face..

One cannot say, however, that this complexity is always a downside, nor even necessarily a detriment to the operation of a successful volunteer department. On the contrary, examples within many other countries have shown that such a communication method can be effectively used in the case of a small, relatively isolated department as it factors in some of the more diverse parts of the community in which they serve. Finding a balance between volunteer and paid firefighters poses a difficult challenge for many governments, especially while still working to retain all of the complexity and nuance that local customs and traditions provide. However, a diligent and thorough application of actor-network theory while keeping in mind those precepts outlined in Pacey's "Innovative Dialogue" excerpt will no doubt provide a solid basis from which to develop an egalitarian response.

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