Apocalypse Soon?
A Study of Ideas about Future Technological Advancement

An Interactive Qualifying Project Report submitted to the faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

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Abstract

The following is a study of the WPI community on their thoughts and ideas associated with the development of new technology. It provides background into the specific areas of technological research today as well as the social and cultural factors associated with its development up to this point. Through video taped interviews and discussion groups, we aimed to answer two basic questions. How do members of the WPI community feel about the future of technology? And what social forces do they believe are driving the development of technology?

What we found was a general pessimism towards the direction of future technology. Our subjects attributed this to their own experiences with technology in their lives so far, which has shaped their future predictions. It is believed that the main driving forces behind technological advancement are capitalism, military, and government. Other cultural and social theories were brought up, including the idea that technology disempowers and separates humans, which is discussed further in the analysis section.

All of the insight from the WPI community we collected was arranged into a video documentary. The video accompanies our written report to completely grasp the purposes of this study, which are to aid in further research and to raise the awareness of what a large role technology plays in our lives, and what that means for our future.

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CHAPTER 1: INTRODUCTION

The human desire to learn and invent has pushed our civilization into an age of technology that seems to have infinite possibilities; from new methods of travel to artificial limbs to military equipment, the list seems endless. There are constantly new scientific advancements and innovations being made and the risks associated with the development of each must be carefully assessed. Because of the rapid acceleration of technological development, we find ourselves as individuals and as a society asking the question: where will it leave us in the end? In this project we explore the spectrum of views of technological risk through research on the Worcester Polytechnic Institute (WPI) population in an effort to gauge and understand the attitudes of the students, staff and faculty of this technologically conscious community. Through the research performed we provide answers to the following questions:

- What attitudes about the future of technological development are held by members of the WPI Community?
- What are the social forces believed to be driving technological development?

WPI prides itself on the well-rounded education students receive and the development of a social conscience with which it is then applied. Students "understand how their work can truly impact society and improve our lives." Because of this claim and the convenient accessibility of the 4,649 full and part time students, faculty, administration and staff members, surveying the WPI community offered an opportunity to gather a range of opinions and insights from technologically savvy individuals. Opening the study to all members of WPI yielded a wide scope of experience and expertise on many areas of technological development. While the majority of volunteers responded via a simple survey and several students and professors also participated in audio-recorded focus groups, the bulk of our results are derived from 30 - 60 minute video taped interviews with students and faculty. The responses we compiled gave us a sample of what WPI thinks about the future of technology, society and humanity.

Important focuses of technological development today include genetic modification, nanotechnology, artificial intelligence, and robotics. Risk can be associated with all of these up

and coming technologies, many of which could possibly lead to the total annihilation of the human race. There are many theories of risk associated with the development of these new technologies, but this study focuses on the cultural aspect of risk perception. Differing cultural standpoints provide differing perceptions of risk, which in turn affects one's views on technology. Individuals' political beliefs, views on morality and lifestyles, including familiarity or daily engagement with technology, also influence cultural attitudes toward new technology. We utilized cultural theories of risk to develop questions regarding the relationship between people and technology. For example, we asked questions that allowed us to classify their attitudes as one of the following three categories: Utopian, Dystopian or Socialist. These very general views reflect individuals' opinions on how technological development will cause positive or negative change in the future. The choice to title our project "Apocalypse Soon?" arose from our own personal thoughts on the future and the idea that technology will either help humanity immensely or hurt it drastically. We chose to make our title in the form of a question because our project is meant to be thought provoking. There seems to be a fine line between these two very different outcomes and we hope the reader recognizes that, and also thoroughly considers why it is that they are both very possible.

Methodologically, our first step was to organize an initial focus group in order to gain a feel for the general thoughts of the WPI population. With background research completed and interviewing methods planned, we began getting in touch with a list of professors who were selected based on area of study. Interviews were organized and conducted on campus with professors first, and then students. Following the interview process, an email survey on personal views was sent to all members of the WPI community with the exception of undergraduate students who were given the survey in person. We also used the survey to find candidates who would participate in a focus group. Two focus groups were conducted which we used to further explore topics that came up in interviews. The material gathered from the surveys, interviews and focus groups was compiled and analyzed to present our conclusions on this research.

There were many interesting thoughts and ideas that came out of our conversation with the WPI community. Overall, the majority of participants were pessimistic about the future because of what has come of technology today due to capitalism. However, there was hope that we will be able to overcome and adapt to the drastic change. By looking at the past it was seen

that good has come through and this good gave hope to those we spoke with. Looking at social and cultural dimensions suggests that technological development may not be the answer to all our problems as a society. This new knowledge associated with technology and its ethical issues made us think about these topics more than ever. We believe that too many people are misinformed on the issues associated with technological development. To inform more people about these issues and get them thinking about the future, we created a video documentary based on our interviews. The interviews chosen for the video reflect the variety of responses and express the overall views of the sample population in an artistic way. The video is thus an educational tool and a set of important project results that we used to develop the analysis found in this report. Each significant topic that arose in our research is analyzed to understand where these ideas come from and what they imply. We hope that our video and report will be used as a tool for further knowledge and exploration.

CHAPTER 2: BACKGROUND

Technology is undoubtedly a large and growing field. In discussion, there is literally no limit to the number of directions that it can be taken in. Knowing this, our group decided to pick three specific technologies to focus on as a place for the interviews and focus groups to begin discussion. The three that we chose were nanotechnology, biotechnology, and artificial intelligence. Each of these is socially relevant because each has the potential to cause huge changes in society, similar to the ways communications and nuclear power did. With these topics as the basis of our project, we conducted our research and gained interesting and thoughtful information on these concerns for the future. We were able to identify three general attitudes towards technology; Utopian, Dystopian, and Technological Socialist. These three attitudes have different ideologies that were useful in organizing and analyzing our results. While the purpose of our study was to discover what the WPI community thinks about the future of technology, we thought it would also be interesting to understand or at least identify why it is they think that way. We chose a few factors that we suspected have a great influence on people's views of technology, such as political affiliation and risk perception. We applied the background research we did on these topics to our project, and were able to develop interesting and thought provoking questions for the interviews and focus groups. This chapter served in aiding us to fully understand the ideas within our project, so that we were better suited to collect results ourselves.

2.1 Understanding Attitudes

An individual's view of whether or not technology is a risk is dependent on their attitude towards it. In our pursuit to understand the different attitudes, we begin by examining some views from the past. The author Bernard Gendron analyzed the attitude trends of the twentieth century in his book Technology and the Human Condition. In doing so, he focused on answering two specific questions; what has been the role of technology in our society? and how large is the impact that technology has on us? The research focused on understanding the social implications of technology and also the different views that appeared in society. Gendron theorized that there were three general attitudes towards the future of technology: Utopian, Dystopian and Socialist. The Utopian, Dystopian, and Socialist points of view offered three distinct ways in which to envision the future of the development of technology. They also provide three excellent ways to classify individuals, which is essential to our study.

2.1.1 Utopian Stance

The optimistic view of the future with respect to technology could be considered the Utopian stance. "According to the Utopian view, all or most of our social progress is due primarily or exclusively to the growth of technology" (Gendron, 1977). The basic premise of the Utopian attitude is that all evils causing problems in society could be solved through technological development in the future. The author presents the "Utopian argument" in four points:

> Premise 1: We are presently undergoing a postindustrial revolution in technology
> Premise 2: In the postindustrial age, technological growth will be sustained
> Premise 3: In the postindustrial age, continued technological growth will lead to the elimination of economic scarcity
> Premise 4: The elimination of economic scarcity will lead to the elimination of every major social evil (Gendron, 1977).

The argument points provide a foundation for the general attitudes of the Utopian view. The social evils that the argument illustrated as being most serious were those centered on the economy, specifically "economic scarcity" (Gendron, 1977). A Utopian believes that all war would end if the economic problems were removed from society.

2.1.2 Dystopian Stance

The opposing attitude is the Dystopian view. Dystopians believe that technology creates more social problems than it corrects. They are concerned with individual freedoms being violated and fear that a third World War could be the result of the non-stop push to advance technology. A Dystopian attitude includes the idea that using and developing technology is breaking a bond between humanity and nature that should not be broken. Dystopians fear that the growing distance between humanity and the nature of the Earth might result in an ecological nightmare that would disrupt the future of humanity. Unlike Utopians, who envision social problems being eliminated by technology, a Dystopian sees technology impacting society in a way that would cause more harm than good.

Although these the Utopian and Dystopian attitudes might seem like complete opposites, they do have some similarities. There are some Dystopians who believe that economic scarcity would be fixed with technology. Many also agree that advancing societies are heading towards a so-called "postindustrial revolution." The Dystopians, however, do not believe that once economic scarcity is eliminated the problems plaguing society will just fade out as well. Even among Dystopians there are differing views, which can be sub-categorized into two other groups: Classical and Counterculture Dystopians.

> Classical Dystopians blame the presumed decline or demise of political freedom, equality, and individualism on the imperatives of modern technology; Countercultural Dystopians blame the presumed growth of psychological alienation on the imperatives of modern technology (Gendron, 1977).

In other words, Classical Dystopians fear the power and control that would come from technological advancement, while Counterculture Dystopians are fearful of perversion of the individual psyche and cultural relation.

2.1.3 Technological Socialist Stance

The third and final attitude towards technology is the technological Socialist view. Technological Socialists believe that technology would not inherently lead us to either a

technological utopia or post-apocalyptic nightmare; the power to facilitate helpful or harmful technological solutions lies in the hands of the individuals and groups who are developing and implementing technology. Like the Utopian view, the technological Socialist view believes that technological development could help us in the future, while also recognizing the problems that could occur because of it. Dystopians and technological Socialists agree that the current capitalistic and opportunistic paradigm for developing technology could lead to a global crisis that could result in the demise of civilization. Unlike Utopians, it is hard for technological Socialists to believe that technology is the way society will rid itself of all its serious problems. Technological Socialists feel that technological developments have skewed social benefits. They believe that the individuals and organizations that influence technological innovation and control the means of production enjoy grossly unequal benefits from the development of technology compared to the rest of humanity. Instead of being controlled by a capitalist class, technological Socialists feel that the working class could better steer the direction of technological development. In the technological Socialist mind, changes in society must take place in addition to technological progress for a successful future. Therefore, there could be no progress in society if nothing short of substantial reform occurred because of technological development.

The three differing views present a basis to begin investigating. Each view has its own ideology towards each individual technology. However, it is hard to categorize an individual as an overall Utopian, Dystopian, or technical Socialist because each technology presents vastly different benefits as well as potential problems. Since each perspective is different and since each individual can be placed into any category for any technology, it is necessary to dive in and find out what creates these differences. The next section begins this debate and allows the reader to gain an insight into how the divisions occur.

2.2 Considering the Political Perspectives

A person's political orientation influences the way they perceive many things, and technology is no exception to this. Different political groups favor different technologies and strategies for its development. Similarly they believe in different social solutions to the problems facing humanity. In American politics, the Democratic and Republican parties hold the majority of support. As we enter the twenty-first century, technology is all around us, always changing and growing. Technology affects nearly every aspect of the lives of every American, Republican

and Democrat alike. While the two parties interact with similar technologies, they have very different ideas regarding its use, its future, and its relationship to humanity.

On the left side of the scale stands the Democratic Party, characterized by principles of liberalism, which is defined as:

> A political theory founded on the natural goodness of humans and the autonomy of the individual and favoring civil and political liberties, government by law with the consent of the governed, and protection from arbitrary authority. A political orientation that favors progress and reform (Dictionary.com, 2005).

On the right resides the Republican Party, characterized by the ideas of conservatism:

> A political philosophy or attitude emphasizing respect for traditional institutions, distrust of government activism, and opposition to sudden change in the established order. Caution or moderation, as in behavior or outlook (Dictionary.com, 2005).

Much like there is a broad range of views amongst Utopian, technological Socialist, and Dystopian attitudes, there is a broad spectrum of political perspectives amongst the liberal-associated Democratic and conservative-associated Republican parties.

As executive editor of *The Public Interest*, Adam Wolfson composed an article discussing the different stances towards current technological advancement, which he refers to as "the cusp of a great technological revolution" (Wolfson, 2001). In his article, he poses a question of caution, "liberalism and conservatism seem to have put out the welcome mat [for an era of 'volitional evolution.'] It is worth asking why?" (Wolfson, 2001). Wolfson's article is focused on Genetic Engineering, a powerful new technology that he believes could "usher in…a 'post human' era" (Wolfson, 2001). Although the argument is based around one specific technology, it shows how politics influenced each technology individually, not technology as a whole. This makes it difficult to classify a person's views as strictly Utopian or Dystopian because each technology posses many different forms of political activity and regulation.

Wolfson begins by examining the principles of liberalism and its benevolent perspective regarding the progress of technology. Then Wolfson questions the liberal ability to differentiate "technologies that fulfill our nature from those that destroy it" (Wolfson, 2001). He also questions principles such as equality and autonomy which may rationalize liberal scientists' "mission to transform the human species" and thus promotes research and use of genetic engineering (Wolfson, 2001).

It is clear that his attempt at a bipartisan essay failed. He clearly favors a more conservative view and even includes a few sarcastic remarks regarding modern liberalism. As a conservative he worries over who would control this unpredictable new technology. He believes that if placed in the hands of liberals that they "will demand government-funded eugenics for the economically disadvantaged" and individuals would easily make uneducated, ill-informed decisions regarding genetic manipulation; choices which should under no circumstances be made ignorantly (Wolfson, 2001). Wolfson's favoritism for the conservative opinion is made even clearer as he praises conservatives and their ability to see that by "understanding human ends as they are revealed in our 'given nature' will we come to see the violation of genetic engineering" (Wolfson, 2001). However, Wolfson's distrust stretches beyond liberal philosophies. He warns that "our inability to resist the new technologies goes beyond inadequacies in our liberal and conservative public philosophies," and this is indeed a valid point. Wolfson is able to make the connection that political influence isn't the only other force governing technology. Our inability to resist comes from the human spirit and the drive to create new and improved advantages.

In a response to this conservative analysis of the liberal attitude towards technology, *Reason* science correspondent Ronald Bailey scrutinizes Wolfson's "unease about technology" in an attempt to support scientific progress with his article "Right-wing Technological Dread" (Bailey, 2001). In many of Wolfson's attacks, he mentions the negative impacts of technology but fails to specify which particular technologies he thinks are damaging humanity. Bailey argues:

> New technologies have empowered more and more human beings to fulfill their own natures rather than be trapped by poverty, disease and the narrow confines of customary bigotries. But human beings do not love less, do not pursue virtue less, nor cherish beauty any less because of technological advances (Bailey, 2001).

Wolfson's conservative argument jumps to the conclusion that potentially misused technology should be condemned. Bailey proves his point against this by explaining that "this is somewhat akin to arguing that simply because airplanes can be used to bomb cities, we should ban jetliners" (Bailey, 2001). "Ultimately, the conservative's worries about technological progress are rooted in a deep skepticism about human intentions," concludes Bailey as he explains that technology cannot be stopped and that "despite the horrors of the past century, technology and science have ameliorated far more of the ills that afflict humanity than they have

exacerbated."(Bailey, 2001).

As both writers offer their opinions for a single controversial, technological issue, it is clear which principles and emotions define each end of the scale. Wolfson's article offers an elegant argument in favor of conservative thinking, clearly depicting the many principles of the more traditional, cautious right, which shows similarities to the Dystopian attitude. The more liberal Bailey counters with rational, progressive questions of Wolfson's key points by giving humanity and technology the benefit of the doubt, much like the Utopian attitude had.

These arguments regarding a single technology coincide with the definitions of their political philosophy as a whole. It is both important and interesting to consider these political perspectives when addressing any technological issue, especially concerning what the future holds. A wide range of principles, emotions and various background factors come into play when defining an individual's thoughts regarding the impact of technology on humanity. Understanding one's political sentiments helps us to analyze the participants' perspectives.

2.3 Risk Perception

The preceding section gives a glimpse into how complex attitudes about technology can be. Each technology has a similar debate with just as much controversy. Part of the reason for the complexity is that these attitudes are based on the way the individual perceives risk. The great part of being human is that you create your own perceptions based on your own environment and interactions. Since everybody is unique and has their own ideas, it makes for a lot of varied attitudes. Exploring the potential risk an individual perceived to accompany the development of technology was crucial in understanding their attitude towards the future. Identifying risk was essentially identifying the direction of the future. Society rejects what it is afraid of; and society, as consumers, have a great influence on which technologies make the step from invention to innovation.

The term risk has been difficult to define and has been continually evolving as society evolves. This was largely due to the fact that in most cases risk was a concept that was determined individually. Much like people decided what fun was for them or what was scary to them, they also decided what a risk was. There were three basic elements that bridge all types of risk. When determining the magnitude of risk, no matter the context, every individual would

consider the state of reality, possibility of occurrence, and undesirable outcomes (Krimsky, 1992). Though it would have seemed that there were too many facets of risk to even begin a good analysis, in their book <u>Social Theories of Risk</u>, authors Krimsky and Golding classified risk into seven categories.

	INTEGRATED APPROACHES (e.g., social amplification of risk)						
	Actuarial approach	Toxicology epidemiology	Probabilistic risk analysis	Economics of risk	Psychology of risk	Social theories of risk	Cultural theory of risk
Base unit	Expected value (EV)	Modeled Value	Synthesized expected value	Expected utility (EU)	Subjectively expected utility	Perceived fairness and competence	Shared Values
Predominant method	Extrapolation	Experiments Health surveys	Event and Fault tree analysis	Risk benefit analysis	psychometrics	Surveys Structured analysis	Grid group analysis
Scope of risk concept	Universal	Health and environment	Safety	Universal	Individual perceptions	Social interests	Cultural clusters
	One-dimensional	One-dimensional	One-dimensional	One-dimensional	Multi-dimensional	Multi-dimensional	Multi-dimensional
	Averaging over space, time, context			Preference aggregation		Social relativism	
Basic problem areas	Predictive power	Transfer to humans Intervening variables	Common mode failure	Common denominator	Social relevance	complexity	Empirical validity
Major application	Insurance	Health Environmental protection	Safety engineering	Decision making	Policy making regulations		
					Conflict resolution (mediation)		
					Risk communication		
Instrumental function	Risk sharing	Early warning		Resource allocation	Individual assessment	Equity fairness	Cultural identity
		Standard setting	Improving systems			Political acceptance	
Social function	Risk reduction and policy selection (coping with uncertainty)						
	Assessment			Political legitimation			

Figure 1 - A systematic classification of risk perspectives (Social theories of Risk)

Figure 1 is a visual representation of these seven types of risk. Each type of risk was identified and broken down into its effective factors, its applications, its functional aspects, how it could be measured, etc. - a very useful tool in understanding how a perceived risk shapes a person's attitude. For the purposes of our study, we expect that we will be able to better understand our subjects' thoughts by applying the economic, psychological, social, and cultural

theories of risk.

The purpose of our study was to gain knowledge about a person's perception of technology and whether or not they thought it was a risk. We collected our own data about how the WPI population views technology and what they think it will be like in the future. Our group expected to receive answers all over the spectrum - some in complete support of the advancement of technology, some completely against it, and a range in the middle that recognize both sides. We were anxious to know what people thought about the topic, and were hoping to be able to determine a few reasons why there were differences in people's perception of this risk. The theories of risk were important resources in understanding attitudes, and we applied them to our own research.

2.4 Public Perception versus Expert Knowledge

Though it has proven difficult to uncover previous studies on public perception of risk regarding the overall future of technology and its repercussions, some research has been done concerning more specific topics and public opinion thereof. This earlier research demonstrates the ties between controversial speculation of what the future holds for technology and the real and perceived risks of that technology. Because there are no measurements or concrete facts about what the future holds, studying what people have to say about the future will never be an easy task.

"Measuring people's attitudes…is an elusive business" concludes <u>Perceptions of Technological Risks and Benefits</u>, based off of their study of the reactions to six specific technologies. Researchers interviewed 1320 individuals and collected background information regarding age, gender, race, income, education, religious preference, marriage status and political views. These subjects were then asked a series of approximately 300 questions regarding their perceptions of benefit, risk, strictness of current safety standards and desired strictness of automobile travel, commercial air travel, electricity and nuclear power, nuclear weapons, handguns, and industrial chemicals. In an effort to quantify reactions, the responses of concern were given on a scale of one to seven, one being none or not very concerned and seven being extremely concerned.

With these numbers in place, it was clear to researchers that perceived risk versus real risk can often vary.

> Respondents in our study perceived the risks of nuclear weapons…as being considerably greater than the risks of automobile or commercial air travel…no one in the United States has ever been killed by nuclear weapons…Many technological risk-managers have concluded, therefore, that the public simply does not know what the risks of technology are (Gould, 1988).

It is evident that there is a separation between the common people and those developing the technology and managing its risks. It is possible that this separation has caused the misinformation of the general population about developing technology. Researchers' concluded that "lay people appear to use a broader and more complex definition of "risk" than do technologists" and thus the definition of risk should be defined on an individual basis. Other smaller studies have indicated similar findings, and also incorporate the idea that an individual's background not only shapes their ideas and opinions on certain topics, but defines the standards for those topics. Understanding where and how subjects have developed their opinions plays an important role in research of this nature. We hope to demonstrate this in our final video presentation.

2.5 Future Technology

Technology is a really broad term that is easier to discuss in its parts as opposed to whole. It was important that the technologies we selected as the foci of our discussion are cutting edge and socially relevant. The controversy that often surrounds cutting edge technology leads to a multitude of differing opinions regarding its development. If a technology is socially relevant - when many different people know about, could be affected by, and have formed an opinion about it - it may be easier to draw connections between the actual technology and the social, political, and economic influences on its development. Artificial Intelligence, Nanotechnology, and Biotechnology are all outstanding examples of technologies that are both cutting edge and socially relevant. We thought it important to do a bit of background research on each of these technologies, not only to explore previous attitudes about them, but also so that we were knowledgeable about the subjects when conducting interviews and focus groups.

2.5.1 Artificial Intelligence

The iRobot Company has created a small robot that is able to detect sniper gunfire. Another feature of the robot is that it can calculate the exact location of the gunfire 94% of the time. Artificial intelligence, along with the robotics industry, is beginning to reach its potential. Developments have occurred for decades and extremely valuable and promising work is starting to show. This robot has the potential to create large change in society; no longer would police need to patrol the streets, because this robot is designed for placement in an urban setting. With testing and experimentation, this robot (or a future model) may be able to patrol our streets more efficiently than our current task forces. The military might also find this innovation appealing. It could potentially reduce human casualties during battle. Imagine a battlefield filled with robots and not a single human among the wreckage. The human emotions of pain, suffering, and mourning that are normally associated with war would be removed, and it would be a blessing to no longer lose life in times of war. Replacing human troops with robots has the potential to be destructive as well. Over time, society might disconnect with the negative sides of war since they haven't any emotional attachments to the robot.

Figure 2 - The Packbot Scout, a battle-tested Unmanned Ground Vehicle (UGV) designed for Military Operations, tested in both Afghanistan and Iraq (www.irobot.com).

If the artificial intelligence community succeeds in creating thinking machines, humanity would be faced with tough choices. Introducing a machine with intelligence will undoubtedly have affects on humanity and many may not be realized before the technology is released. Some

people believe that intelligent robots will help humanity while others feel it will only lead to disaster. Utopians believe that our society would see an increase in leisure activities and a reduction in tough intelligent decisions. Dystopians on the other hand would feel that this technology could impose on our freedoms and might remove human thought from society. A Dystopian might envision a future similar to the way it is depicted in the film "The Matrix." Joseph Weizenbaum states that "if we had a machine that could think as well as people, and whose detailed workings were completely open to inspection, we would find intellectual respect, pride, and admiration impossible" (Maybury, 1990). It has the potential to be true that if a machine could think as well as us, scholars and intellectuals would not be held in as high a regard. What would be the point of going to school if a machine could answer any question that could be asked? Fortunately the question doesn't have to be addressed at the moment. Although there have been improvements in artificial intelligence, the technology is currently still far from becoming level with human intelligence. Intelligence is currently a field where more research still needs to be done to explain how conscious thinking happens. Today, neuroscience has become a large industry because it offers solutions to the questions many ask about intelligence.

If intelligent technology is released gradually, it could result in an increase in leisure activities for all of humanity. With careful installment, a technological utopia could exist in the future. Artificial intelligence has the potential to "liberate human minds from uninteresting, mundane, and repetitive tasks, not to mention the dangerous or unhealthy ones (e.g. diffusing unexploded bombs)"(Maybury, 1990). With the liberation of the mind, more leisure jobs could be opened and it would be possible to create entirely new types of professions. Additionally, machines would not only be beneficial to the employer but also to the worker. Upon scanning an item at a register at many stores, the stores inventory is modified almost instantaneously. This process is far more efficient than written copies of what is sold and transferring the sales list to the inventory list. By having a machine take care of the tedious and uninteresting inventory job, business is able to profit and workers are able to pursue more interesting work. If technology is applied in similar ways to benefit the economy and to liberate the workers, then a technological utopia may very well exist in the future.

Artificial intelligence may also bring a revolution to society similar to when machinery was introduced to the labor force. Machinery was able to cut down process times and increase

outputs. This had a huge negative impact on blue collar workers. Technology has to this point progressed and reached a point where "humans are beginning to lose intellectual skills to machines" (Maybury, 1990). For example, some teller/cashier jobs have recently begun surrendering to machines.

Figure 3 - Theoretical Artificial Intelligence (*www.usatoday.com*)

Automated tellers have become increasingly more popular with each passing day and most banks have started incentive programs in order to influence customers to choose to have an ATM card. As the artificial intelligence community progresses, intelligent machines could be capable of making the executive decisions that CEO's and presidents make. This technology would bring a new revolution that could potentially turn the system completely over to machines. If we continue to develop software, programs, and machines with fewer flaws, in the future we may build a machine that is flawless and capable of reproduction. This feeling of losing to the machine is the Dystopian sentiment. The favorable balance of human over machine can still be kept if the technology were introduced gradually, similar to the intervals of progress during the 1900s. Our society may be able to adapt and survive like it did during the 20th Century. If technology were released before the social implications were discussed and resolved, humanity could lose its place as the dominant species on the planet. However, with gradual change, humanity may be able to once again conquer the machine with minimal skills lost.

With such a strong reliance on calculators, many people have begun to forget simple tasks such as long division and times tables. Most people below the age of 25 have probably never used a slide rule. Changes such as those were related to the technology of the time period, and as Maybury states "Some skills may simply be replaced with those required of a more advanced society- a kind of 'mental Darwinism' as in the progression in transportation from knowing how to handle a horse to knowing how to drive an automobile"(Maybury, 1990). It is acceptable that some skills were lost because reasonable improvements on previous methods have been made - and so the idea of "evolutionary thought" arises. Evolutionary thought is the theory that the mind evolves, learning and forgetting skills based on their relevance and contribution to survival.

Artificial intelligence poses great risks and rewards to humanity. However, it is believed by technological Socialists that society would decide which way it goes. The intelligent machine wouldn't under its own initiative lift humanity to the realm of leisure but it also wouldn't suppress lesser intellectuals. Technological Socialists believe that society will control the direction of artificial intelligence. Until society embraces the technology, artificial intelligence won't push humanity in any certain direction. Rather the technology would be useful to the minority that understood it. The technology either becomes an innovation by being more advantageous than current systems/processes (i.e. Lean Manufacturing) or by being thrown into the forefront (i.e. the atomic bomb and nuclear power). By allowing society to control the technology, the best outcome for all of society could be obtained.

2.5.2 Nanotechnology

Nanotechnology is the push to take current achievements and to produce them on a nanoscale. It is currently a broad term used in fields of medicine, energy conversion, energy storage, optics, and material science. Nanotechnology offers the appeal of a go-anywhere-do-anything automated machine. It requires advancements in engineering, mathematics, and science in order to continue to move forward, but is beginning to excel because "government agencies act as promoters of initiatives, and they have begun to fund university research and graduate training, as well as research and development in national laboratories" (Weil, 2003). Many corporations have been attempting to exploit nanotechnology and have been developing commercial nano-products.

Figure 4 - Nanobot in the Blood stream *(news.softpedia.com)*

Innovations would not occur if potential good couldn't come of the invention. Like all other technologies, nanotechnology presents many potential benefits to society. An example can be seen in Figure 4. Nanotechnology has produced machines that have traveled among arteries and veins. The ability to eliminate world diseases by the use of machines has been presented. A nanomachine could enter the body and destroy individual cancer or AIDS cells without damaging neighboring cells. This would have tremendous benefit to today's cancer patients who must endure hours of chemotherapy. Utopians believe that nanotechnology would be used to alleviate society of problems such as disease.

There have always been inherent problems associated with the introduction of a new technology. The acceptance of the technology included the unforeseen issues that were introduced and the desired changes that occurred. Nanotechnology will be no different and will bring problems to society as well as benefits under today's current patterns. The best way to grasp what some of these issues could potentially be is to "step back for a look at recent history. Study of our experience with biotechnology and information technology may help to identify sources of ethical concern even as we acknowledge claims made for the uniqueness of nano-science and nanotechnology"(Weil, 2003). The race to improve nanotechnology can be seen as similar to the early 1990s, when both the telecommunications network and genetically modified products exploded onto the market. Similar to today, technology in the early 1990's was being developed quicker than society was assessing it. This increase in production speed meant corporations were releasing products that hadn't been studied to understand the changes they

would create. Problems could have been avoided if the time had been taken to study the developments before release to the public. If thought had been placed into the types of gases that we release the ozone layer might not have been punctured.

It has been stated that "conventional methods of risk assessment are incapable of identifying what may be most distinctive about the technology, and its wider ethical and social implications"(Wilsdon, 2004). Nanotechnology is presenting issues that have never been imagined before. One of the major problems with nanotechnology is that particles, when reduced to the nano-scale, behave unpredictably. These issues must be studied if nanotechnology is going to become mainstream technology. In order to gain the most from this technology research groups must consider the societal implications. Only by making findings public and open to public scrutiny can society hope to gain the most from nanotechnology's advancements.

2.5.3 Biotechnology

The field of biotechnology has unmasked many workings of nature. Medicines have been created that cure viruses within hours. Regular doctor visits have become routine due to the amount of shots that patients take. Many diseases and viruses will be and are eliminated by the progress of biotechnology. Utopians are hopeful that soon a cure for the HIV/AIDS virus will be discovered.

Since the mapping of the human genome, scientists are able to surgically alter DNA. By altering DNA, nearly anything that is naturally occurring in nature can be recreated and made better in a lab. Biotechnology holds the secret to understanding life and perhaps the most shocking success was the cloning of a living mammal. A lot has been learned recently and genetic modification is becoming well practiced. Biotechnology has dabbled with plant genetics and created strains of crops that require less maintenance and are resistant to natural predators. These same crops are also able to produce more food than their natural counterparts. In time this type of genetically modified food could save many lives. Crops that are necessary for human survival could be modified to grow in any part of the world.

Figure 5 - Dolly, the First Mammalian Clone (*24hourmuseum.org.uk*)

The risks to these biological discoveries are highly debated. While it is significant that we make breakthroughs on the health front, one might wonder about the moral limitations of this technology. Nearly any health problem could be cured, or is on its way to being cured. Life expectancy is on the rise and will likely keep becoming longer. Can we make ourselves immortal? Can we create the perfect human? In his book The Biotech Century, author Jeremy Rifkin argues that by changing our genetic makeup, we are essentially changing the human species as we know it. Rifkin, like many others, believes that we are interrupting the natural path of evolution that has been occurring for millions of years. With the possibility of perfecting a human's genetic make-up, in the future it would be possible that less-than-perfect people may face genetic discrimination. No longer would you be judged on intelligence or abilities, but on your genetic makeup; turning the contents of your genome into an outrageous social construct. This scenario is considered a Dystopian view of biotechnology. Biotechnology pushes ethical and religious boundaries and our study is intended to capture thoughts about this.

Besides the risks to human societal hierarchy, biotech companies are also beginning to unintentionally pose a great threat to the environment. There are more than 1300 companies in the United States alone and each produces hazardous biological and chemical waste. Pollution has become a problem that could become bigger than we would be able to handle. If labs, in all

industries, start managing their wastes better, this problem could be mitigated.

The types of altered life forms that could be created by gene manipulation would have been inconceivable 100 years ago. Now, the United States alone currently spends more than 13 billion dollars per year on genetic research (Rifkin, 1998). Logging companies have been known to pay for the creation of a tree that yields more pulp; mining companies have been known to pay for the creation of microorganisms that will do their digging. Not only is this harmful to the environment, but it has also put many people out of jobs because their role as an employee was filled by a colony of bacteria. The idea of corporate good versus social good will be discussed in our focus groups as well as explored in the individual interviews.

Biotechnology has the potential to unleash great power, however it is up to society to decide how the power will be used, believe technological Socialists. Like the other technologies, the technological Socialist view of biotechnology recognizes the potential of both the Utopian and Dystopian stance. It can be seen that biotechnology has the power to create that which could not be destroyed. This could be some sort of bacteria or other life form. Under correct conditions it would be beneficial to have something that can't be destroyed. People suffering from famine because the land is currently unable to sustain life could potentially receive modified crops that could grow in the previously scarce area. Unfortunately, it was discovered that some genetically modified substances posed health risks. Socialists feel that this type of contrast between benefit and risk should be analyzed by society and then a course of action pursued.

2.6 Putting the Puzzle Together

By having an understanding of risk and the types of attitudes, our study gained a base of knowledge to help direct the project. The following chapter outlines the next steps in continuing our project to find out how WPI views the future of technology. The process was designed around the knowledge we gained about the three technologies and the three differing attitudes, as well as factors that influence them. We wanted to use all of the research we did to evoke very real and deep answers from our interview and focus group subjects, so that we might obtain some very thoughtful insight into the future of technology.

CHAPTER 3: METHODOLOGY

Once we gained an understanding of the information on future technological development through literature research, we then had to decide how we would use it in our study. This chapter is a summary of the steps we took to answer the following research questions:

- What are the differing attitudes toward the future of technological development held by members of the WPI community?
- What are believed to be the social forces responsible for driving technological development?

These questions were answered through personal video interviews and focus groups with WPI faculty and students, where we asked questions based on our background research. The best way to explore this was to communicate one on one and in groups to those who are involved in technology's development. The first part of this chapter explains what we decided to investigate, and how we used what we learned through our investigation. Later the conduct of interviews, which is a primary part of our investigation, is explained in detail.

Another primary tool of investigation is focus groups. A focus group is a thoughtful, guided discussion about particular issues. These discussions and the proper methods of getting the most out of them are explained later in this chapter. Focus groups were used because they would allow groups of people to discuss a particular issue, thus providing insight. Having a group discuss enables participants to give reasoning behind their ideas, which can provide more and different information as a topic is examined by several people with differing views. Our process along with the information we gathered is given in subsequent sections.

A third method to retrieve information was a survey. There were two versions of the survey due to unforeseen complications. The first was an electronic copy and was sent to the faculty and staff of WPI. The second version was a paper copy and was handed to students of WPI. This third technique was intended to recruit participants for the focus groups and interviews, and to gain the sample's general feelings towards technology, politics, and religion.

This chapter thus describes all of our methods. It contains the many different processes that were needed to investigate the objectives. The survey was an excellent recruitment tool and also provided us with some results. The interviews and focus groups were videotaped so that we could create our video. The video is an excellent visualization of our results as well as an

informing piece of media to be used to inform the public and initiate discussion based on these topics.

3.1 Decision to Study WPI

It was our desire to gain applicable, accurate, and detailed information regarding the WPI community's attitudes towards the future of human interactions with technology. The primary reason we chose to limit our study to the WPI community is the logistical problems we would face in extending it to other colleges, as well as Worcester as a whole. Members of the WPI community operate on the same quarter-based schedule as the project team and have easy access to the campus, where most of the interviews took place. As members of the WPI community ourselves, we had many contacts on campus and no shortage of faculty, students, and staff to participate in our study. WPI is also ideal for this particular study because the entire community is closely tied to the development of technology. Most members of the community are well educated in a variety of highly technical fields and either have or will soon contribute directly to the development of technology. As a result, the opinion of the WPI community regarding the future of the development of technology is especially important. Members of the WPI community will be amongst the developers of technology in the future and their optimism or pessimism about the future will probably deeply affect how they choose to contribute to the development of technology.

3.1.1 Technological Relationship

It seems reasonable that a person's personal relationship with technology, as well as the social forces they feel drive its development would have the greatest influence on the overall optimism or pessimism of their outlook on the future. If a person directly benefits from technology both for their livelihood and in their daily routine, it was hypothesized that they would have an optimistic outlook on the future of technology. For our purposes, we considered this as the Utopian attitude. On the other hand, if technology has been a detriment to the individual, they are likely to have a pessimistic outlook. Likewise, we wondered whether a subject might be more likely to have an optimistic outlook if they consider the social forces responsible for the development of technology to be the same social forces that seek to alleviate the problems facing humanity. If they feel the social forces behind the development of

technology are those responsible for the current problems facing humanity, it is likely that the subject has a pessimistic outlook on the future of technology and for the purposes of the study was considered the Dystopian attitude. We examined the individual's political and religious orientation to determine the key role they play in influencing their views about the development of technology.

3.1.2 Interview Data Collection Overview

Interviewing, while detailed, does not present the opinions of more than the few people interviewed, nor does it test ideas against each other. As such, we used a two part data collection scheme in our study aimed at gathering broad opinions from many individuals, details of those opinions from a select few, and testing those opinions against each other. The two parts are respectively:

> Personal videotaped interviews
> Small discussion-based focus groups

The videotaped individual interviews were the most in depth and descriptive portion of the study. Ideally, we hoped to conduct 30-45 interviews, each running for about 30-60 minutes. Unfortunately this wasn't possible and we were only able to conduct 18 interviews. More were scheduled and rescheduled, but people were still unable to participate. Two or three project team members were at each interview, but only one acted as interviewer. The others were either managing the recording equipment or taking notes. The subjects we interviewed were either WPI students or WPI faculty. The questions for the students and faculty were nearly identical. Each interview focused on the subject's general views regarding the future of humanity and technology, although some time was devoted to the subject's area of expertise. The interviews were conducted following the guidelines in section 3.2.2 and the questions were designed in the format described in section 3.2.3. The questions were geared at discovering and elaborating on the individual's personal opinions about technology. As such, their personal interactions with technology, on both a daily and a professional level, were explored. The subject's feelings regarding the social forces behind technological innovation were also very important to us. Through the video interviews we hoped to paint a picture of the optimism or pessimism of a subject's overall outlook regarding humanity and technological development. Interviews were conducted over three weeks, the first during the break between A and B terms and the second

during the first 2 weeks of B term. Interviews were held in a quiet room located in Higgins Laboratory Room 208. The room was chosen because it was free of unnecessary distractions.

3.1.3 Focus Group Data Collection Overview

We conducted two focus groups, the first consisting of six WPI students and the second of three WPI administration and staff members. Unlike the individual interviews, most of the project team was at each focus group, with one acting as moderator, one monitoring the recording equipment, and the rest taking notes. The focus groups followed the same general line of questioning as the videotaped interviews, but differed in the scope of their focus. Whereas the interviews were primarily concerned with the opinions of the individuals being interviewed (How do *you* relate to technology?), the focus groups were concerned with the broader picture (How does *humanity as a whole* relate to technology?) We hoped that these questions would cause the individuals to discuss the personal opinions explored during the videotaped interviews. Although one hour was a relatively short amount of time, we hoped to learn more about the ideas of our participants as they explored each others' beliefs of technological development. The focus groups were conducted during the second and third weeks of B term. They were also held on campus in a distraction free environment and were not videotaped. The focus groups were also conducted in Higgins Laboratory Room 208.

3.1.4 Video Overview

In the end, video footage from the individual interviews was compiled and organized using a computer program, which was then edited to create a video documentary. This video presentation begins by outlining the specific technologies we were interested in exploring. It then presented people's hopes and concerns regarding these technologies, as well as their ideas towards the general idea of technology and its purpose. We hoped that the interviews would provide either a single or several key points of discussion about technology. These key points were covered thoroughly in the video with regards to the social forces that have driven innovation in the past, and what each individual feels is likely to happen in the near and far future. The video closed with recommended paths for the future from the subjects of our investigations.

3.2 The Interviews

The videotaped interviews were conducted individually with professors and students from the WPI community in order to develop a detailed description of the subject's opinions surrounding the advancement of technology. The critical pieces of these descriptions included the individual's personal relationship with technology, their overall attitude towards the future of technology, and which social forces they believed drives the advancement of technology. An individual's personal relationship with technology is not limited to their daily interactions with technology or involvement in the advancement of technology. Through research we believe that opinions are influenced by interaction with machinery and technology, including the level of complexity of the technology. Another large factor was their view of technology as a luxury or as a necessity. As such, our questions were designed to accurately and objectively elicit the individual's perspectives.

We hypothesized that personal factors have a heavy influence in the overall optimistic or pessimistic attitude of the individual regarding the future of technology. It is important to see what technologies people view as successes for humanity and which had been roads to destruction. It was interesting to find what people perceived to be the future role of humanity on this planet. Will we reach a technological utopia or a post-apocalyptic nightmare?

Regardless of what the future actually holds for humanity, society and technology will be continually shaping each other as they progress forward. It will be critical to understand which social forces our subjects thought would drive the major social and technological changes. The subjects' attitudes toward the social forces they believed would bring changes in the future must be explored to understand their relationships to the specific forces.

Maintaining a delicate balance between careful preparation and flexible insight was crucial while conducting the interviews. A lack of preparation makes the interviewer seem uninterested and unprofessional. On the other hand, too rigid an interview would have resulted in short, uninformative answers and would not produce valuable lines of thought. As we learned, good interviewing can be seen more as a sense than anything else. A good interviewer was able to uncover things even the interviewee didn't know about them self.

3.2.1 Preparing for the Interview

The interviewer was careful to maintain a good balance between prepared questions and impromptu follow up questions. The core of the follow up questions was drafted before the interview. Preparation for conducting an interview, however, involved much more than just drafting a list of questions to ask the interviewee. The setting, background research, and question format were also considered.

The purpose of the interview was to elicit firsthand accounts and descriptions of events, people, and ideas from the interviewee. As such, the interviewer was adequately well read on the subjects discussed, in particular anything that was written by or about the interviewee. Questions were asked about what the interviewees were currently working on as well as what brought them to WPI.

3.2.2 Conducting Interviews

It was important that the interviewee felt comfortable during the interview, but not so comfortable that they became distracted or drowsy. Often the interviewee's home or office could be used. The downfall to using the interviewee's home or office is the increased number of distractions such as phones, clinking cups, etc., many of which the interviewee is quite used to in their daily life, but can drastically affect the quality of any recordings made. That reason was also part of why the interviews were done on campus. The positioning of the interviewee with relation to the interviewer and the recording equipment was very important. The interviewer sat perpendicular to the interviewee and the recording equipment was placed somewhere unobtrusive but readily available. A member of the team was able to easily and quickly check the performance of the recording equipment without interrupting the interview.

It was especially important when interviewing people about their ideas that the interviewer asks questions that were unbiased. Instead of asking 'Would you say that the future of the world is in peril?' the interviewer knew to ask 'What do you think the outlook for the future of the world is?' In addition to a lack of bias, it appeared to be a good idea to add a simple preparatory sentence before each question. The sentence served as a background for the question, giving the interviewee a better idea of the question being asked. This helped reduce the number of times an interviewer had to repeat or rephrase a question and was especially useful for changing or returning to a line of questioning.

3.2.3 Our Interview Process

In beginning the interview process, we discussed who we wanted to speak with from the WPI community. We thought about professors that work in fields relative to those involved in our study. We had access to professors in fields related to artificial intelligence, biotechnology, and robotics. There were also professors in psychology and humanities that offered some interesting opinions on future technology. However professors do not make up the whole of the WPI staff. There are also secretaries, librarians, lab operators, food servers, etc. We decided that librarians and tech lab operators were possible candidates for interviews. Not only had we wished to speak with the faculty and staff, but the student body as well. There are people from all over the world who attend WPI. The interviews were held from October 20th through November 12th of 2005.

To contact the professors we wanted as interview candidates, we devised an email letter asking for their participation in a video interview as well as some general background information. This email draft can be found in Appendix C. We made an effort to be specific without giving an excessive amount of information to take in. Discussion was raised when deciding what we should title the email. In this day, personal computers are spammed with tons of useless emails. We wanted a title that would stick out and grasp the reader's attention but be short and direct. The decision was made to title it "The Future of Technology." In addition to this email, we constructed two short surveys. The first was an electronic version and was sent to the faculty and staff of WPI via email. The second was dispersed to all graduates and undergraduates in an attempt to find more candidates among the student body. These surveys began with a short introduction to our project and asked the candidate to choose one of three different descriptions that best represented their own opinions about the development of technology and the future of humanity. The three descriptions each represented either a Utopian, Dystopian, or Socialist opinion. The survey also asked for the gender, religion, and political orientation of the candidate. The survey then asked if the candidate was interested in participating in either an interview or focus group. Those who replied positively to this question were contacted by email to schedule their interview or focus group. An example of the email survey can be found in Appendix E. Although this email survey was used primarily to find participants and allow us to create balanced focus groups, we also applied the results to our conclusions about the overall optimism

or pessimism of WPI. We had also spoken with friends and community members that we thought would have interesting opinions and asked them to participate.

Once we received responses to the professor emails, we made an effort to respond back quickly to confirm an interview time and place. We held these interviews in a typical WPI environment. Higgins Laboratory offered a meeting room that was suitable for quiet and comfortable interaction. We booked a single room for all interviews to provide continuity between each. It was important to take into consideration what would be in the picture besides the interviewee. We decided that a plain background would be best to provide continuity to the video.

Our next step was to gather the equipment necessary for conducting a video interview. We acquired a Sony Digital Camcorder and several recording tapes. Luckily one of the group members was the owner of the camcorder so we only needed to pay for the recordable tapes. It was necessary that there were enough tapes to record at least one hour. An hour of time was registered for each interview and thus it was only necessary to have enough tape for one hour. The only other equipment needed was a pitcher and cup for water. Providing water to the interviewee showed courtesy while also preventing them from drying out while speaking for an extended period of time. Once we acquired all of our equipment, we were ready to conduct the interviews.

During the interviews, it was necessary for group members to take on specific responsibilities. One member was responsible for recording the interview. The camera man made sure the interviewee was in full view and that the camera remained stable during recording. The camera man had knowledge of the workings of the video camera. Another member was the recorder and took notes on important and relevant information that the interviewee provided us with. The secretary was mainly concerned with creating an outline of the interview with time stamps and important details. The most important job in conducting interviews was that of the moderator. The interviewer was responsible for the order of questions and flow of the interview. The most important responsibility of the moderator was to really listen to what the interviewee was saying. By listening, the moderator was able to probe deeper and find more substantial results. Both the moderator and recorder knew the interview questions well. This helped with the flow of the interview by knowing what to look for or ask more about.

Before we started asking interview questions it was important to greet our candidate and make them feel comfortable. We first introduced ourselves and gave the project's name and main objectives. Thanking the interviewee for participating was important because they have put aside time to help us with our project. We let the interviewee know that our time speaking together was a fun and insightful experience for both parties. A confidentiality agreement was discussed to assure the interviewee of exactly what their video interview recording will be used for. It was also important to let them know that the general public was the audience for this video. Once we finished providing the information we thought the interviewee needed, we then asked them if they had any additional questions about the project and answered them accordingly. Figure 6 provides the key questions that the moderator asked during our video interviewing sessions. Some questions were modified for the specific interviewee, because every interview was different.

- We are particularly interested in information about Nanotechnology, Biotechnology and Artificial Intelligence. Are any of these of particular interest or concern to you?
- Are there any new technologies being developed that are of particular concern to you?
- How familiar are you with this specific technology?
- What benefits do you think this specific technology might bring?
- What problems do you think this specific technology might bring?
- Do you think the potential benefits outweigh the potential problems?
- Should the development of this specific technology be controlled in any way to reduce risks? If so, how and by whom?
- What is driving this specific technology's advancement?
- If the future were described in terms of a science fiction movie, what would it involve?
- Reflecting on the views you've shared with us concerning the future of technology, what do you think influenced these views?
- How does technology affect your everyday life?
- Do you think politics plays a role in technological development?
- What are your political views?
- Do you think religion plays a role in technological development?
- What are your religious views?

Figure 6 - Interview Outline

Every once in a while the moderator didn't ask all the questions that another group member thought should have been asked. The other group members took it upon themselves to ask additional questions if they felt more information was needed. When we were finished gathering information through exploring with the questions, the moderator asked the interviewee how they thought the interview went. He also asked for input on how they think we could further improve our project. Again, we thanked them for their time and assured them that what we have learned

through speaking with them is very valuable to us. We then asked if there was anyone specific that we should speak with, to aid in finding more potential interview candidates.

The videotaping of the interview, as introduced above, involved the maintenance and operation of the video camera. Two recordable tapes were brought to every interview to assure that we had more than an hour of tape time on hand. The introduction and conclusion of the interview were not recorded. Recording focused on the answering of the questions stated above. The interview room we used allowed us to use electricity to power the camera, but we kept a battery charged for portability. The camera remained stationary on a table during the entire interview. The operator assured that the camera was recording and that tapes were switched when time ends. It was important for the camera operator to politely tell the interviewer when recording began and ended.

The recorder took detailed notes on the answers to the interview questions above. A proper note sheet can be found in Appendix B, which helps organize the information collected. The basic information about the interviewee that we wished to gather is presented in the top portion of the notes page. To help find specific information while editing the video interviews, the time at which the quote was said was recorded on this sheet. The recorder had a sheet of the interview questions handy, and knew them well before we began interviewing. To avoid running out of note sheets, the recorder kept several copies on hand. Once all interviews are completed, the notes were reviewed by the group and discussed. The results were written up to add to our project. Thoughts on what we learned are discussed along with what improvements we could make for later interviewing are presented in Chapter 5. The videos were reviewed for visual and audio quality. After we finished each interview, we recorded each onto a DVD using a DVD Recorder. The DVD copies were used to transfer our material to computer for editing of our final video.

3.3 The Focus Groups

Prior to research on focus groups, the group had hoped to use the collected video interviews as a starting point for discussion in focus groups made up of the previous interviewees, as well as additional members of the WPI community. However after some research this idea was abandoned. We forfeited the idea because it would have increased the

complexity of the process as well as potentially creating a chance for participants to agree with the stated opinion. If that were to occur, our focus group would have been a waste because no new information would have been gathered. We gained several results from these focus groups, primary of which was to get a more encompassing picture of the future as a result of group discussion. The goal of the focus group was not to find one answer but rather to gather divergent opinions. Lots can be missed when seeking for one solid answer. By finding many differing opinions, we were able to get an overview of the community, allowing us to see major and minor trends within the community. The focus groups might also result in changes to the previously acquired opinions of the interviewees.

3.3.1 Conducting Focus Groups

All focus groups are built on 5 characteristics: "(1) people who (2) possess certain characteristics and (3) provide qualitative data (4) in a focused discussion (5) to help understand the topic of interest." (Krueger, 2000). These five characteristics were easily defined. The groups were made up of people and for our study the groups were filled with WPI students as well as WPI faculty. Good groups have been found to be between four and 12 participants. (Krueger, 2000).) Our target group size was six or seven people. If too many people were present some opinions may have been overshadowed or overpowered. Also with more people it would have been harder to keep everybody in the discussion. People may have started to chat with their neighbor or participants may create alliances and overpower other's expressions. The other side was that if there were too few people the discussion might not start. If the moderator wasn't careful, the session could end up as a question and answer type of discussion, which would have been contradictory to the idea of a focus group.

3.3.2 Purpose and Saturation

The focus groups required a good amount of planning ahead of time. In order to achieve saturation, it required sufficient time spent planning and preparing the discussions. Our process was designed to reach saturation but unfortunately the project didn't allow enough time to accomplish this completely. Further research would need to be done to gain saturation. However, our study is still relevant because it developed a basis for further studies in this area, as well as bringing this information to the general public. First we determined what the purpose of

conducting focus groups would be. The conclusion was that the purpose of conducting focus groups was to develop an understanding of how people view the future of technology and what factors help develop those views. The purpose was discussed earlier in the introductory section to this chapter with relation to how focus groups fit into the process.

Within the groups, the questions were open ended. This kept people from simply answering yes or no. It allowed a healthy conversation to ensue and develop. It was the job of the moderator to decide when to move from question to question. The transitions between questions were smooth and didn't disrupt the conversation but rather guided it. By progressing through the topics, the groups yielded more data for us to analyze. The goal of the groups was to gain enough opinions to be able to conduct a thorough analysis. The end of the sessions didn't feel as if a conclusion or consensus has been reached, but rather that opinions on both sides had been expressed and explored.

3.3.3 Filling a Focus Group

Choosing the participants was a difficult process. We wanted to find people who share some common interest. This helped to ensure somebody wasn't alienated within the group because of interest. Also this can helped the group get into a discussion because they all had something to talk about. For our study, we picked groups of students and faculty. The groups were formed based on results from the surveys. This ensured they all had some interest in the topic being discussed.

The moderator, however, was unidentified with any of the issues that are brought up in the discussion. Our research informed us that if the moderator were associated with the topic, it would have presented a bias in the discussion and the members would have felt the moderator had a specific view of a topic. This could have made the participants feel that there was a right or wrong answer to the questions. By being unbiased it didn't prevent anybody from speaking their opinion. In <u>Focus Groups</u>, the authors used an example of a boss moderating a group of employees about incentives, procedures and other various elements. Obviously there was a flaw in those groups because the employees won't express fully how they feel because of a fear of reprimand.

3.3.4 Focus Group Models

Focus groups have been in use for years and studies have been conducted to see how best a focus group works. From these studies, four designs were recognized as the best ways to conduct a group. All of the groups were conducted in the same way and contained the same number of participants. A single category design is the traditional setup. It is designed to target the desired group within a population. These groups give information that is relevant only to the targeted section. The single category design was too focused for the purposes of our study. It would have limited the diversity of the opinions we were hoping to gather. Multiple category designs involve dividing the population into smaller categorical groups. This allows the analyst to see trends within and between different groups. A multi category design was helpful to this project. It allowed us to receive the most diversity in our opinions and also allowed us to see any trends that were specific to groups or to the population.

In our study, one way of creating multiple categories was to divide groups by technological interest or concern. A double layer design allows the analyst to understand opinions to a higher degree. The study would have involved more division between the groups. An example would have been dividing groups into students and professors but then to divide both groups again into the region in which they studied. This type of study would have allowed for a more specific analysis of a larger population. This design wouldn't have worked with our study because it would have been too specific. Also our population wasn't big enough to warrant that type of study. The last design style, the broad involvement design, is a combination of the others. This design creates a majority of the groups similar to the setup of a single category design. However to understand where these opinions are coming from, the design also looks at a couple groups which effect the primary groups. An example of this study was a study that was interested in student's eating habits. The analyst would have primarily focused on the students; however it would also have been helpful to talk to parents, teachers, and food services. This study allowed for a through analysis of why students eat a certain way because it addressed the concerns of the students as well as those who regulate the students' eating.
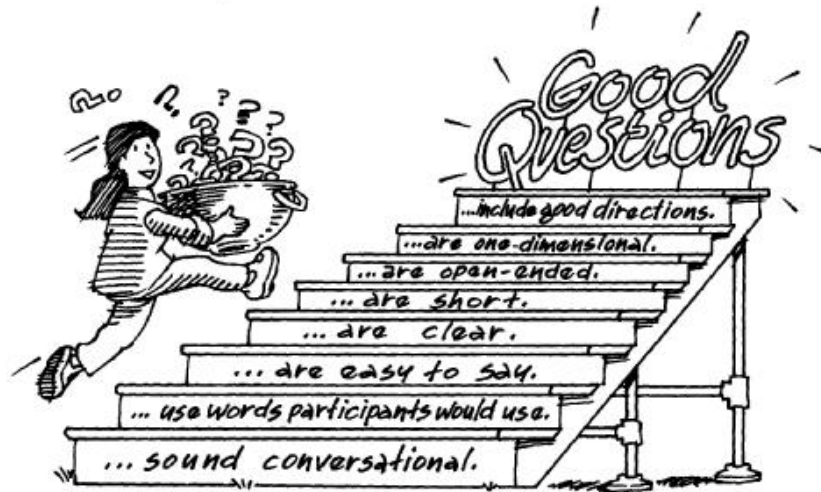
3.3.5 Development of Questions

Figure 7 - Question Formation Flowchart (Kreuger, 2000).

Developing questions was a difficult process. The book, <u>Focus Groups</u>, was helpful in providing a guide to improving focus group questions. In order to be successful, the questions needed to be well understood. If not, the answers provided may not have been accurate or even on topic. Also it was recommended to be conversational. It helped to present the questions clearly and unbiased to the participants. Another key feature of a good question was to use words that people use when conversing about a topic. This way all ideas and points could be understood, especially to the other participants. The clearer the question was the more differences there were in replies, which sparked better conversation. It was necessary that the moderator was able to clearly convey the question to the group. If there had been words that were unfamiliar or sentences that sounded awkward, the moderator may have stumbled and confused participants. Interruptions in the delivery of the question would have disturbed the flow of the group and could have interrupted the discussion. In order to get the most out of answers, the questions needed to be clear and not long winded. The participants could have become confused if a question had been too wordy. The discussion would not have been helpful to us if participants were being confused by unclear questions. An example of an unclear question would be a question with a long introduction filled with background. It could have resulted in an overload for the participants and could have potentially brought the group off track and wasted valuable time. Part of the objectives was to get a picture of how people viewed the future, and

focus groups were an excellent way to draw that picture. Focus groups were intended to present descriptions and illustrations about topics.

When we developed the questions, it was important to keep in mind the order in which they were asked. The focus groups were more successful when the questions followed an easy logic pattern. This order helped to eliminate off topic answers as well as to help keep participants engaged and on target. At the beginning of the focus group, it was beneficial to begin with easy to answer questions. These questions were as simple as having the participant give their name and something of interest to them. This helped to make the atmosphere more comfortable because everybody started the session feeling like they have contributed positively by giving a "correct" answer. After giving the introductory questions, it was important to keep the topic general and as the questions proceed to begin to get more specific. This funneling of thoughts helped to keep the group moving forward and allowed them use previous answers as background to their next answer. The ideal way to do was to introduce the topics by using broad questions and then to progress to the core questions. It was important to find transition questions that helped smoothly guide the group into the specific topics. At the end of the questions, an "all things considered" question was asked. The idea behind the question was that it would allow the participant to summarize their input within the group in one solid answer. This was beneficial to use when we began to analyze the results that we received.

3.3.6 Preliminary Focus Group

Before we began our in depth interviews and focus groups we conducted a preliminary focus group. This focus group was setup to test our abilities at conducting a focus group, as well as testing our questions to see if we gain saturation. It was conducted with all the seriousness of our primary focus groups later in the project.

As such, it was important to build a comfortable group environment within the focus group. The six participants were asked to share some information about themselves, including their name, major, age, hometown, etc. We then described the nature of the project and told the group what we hoped to gain from their participation and discussion. We then progressed through our questions until the hour was over.

We began by exploring the relationship between humanity and technology and continued on to sketch a general outlook for the future and what social forces will help shape it. To

conclude the focus group we asked for feedback and suggestions, as well as future participation in the more in depth portions of the project. An outline for this preliminary focus group can be found in Appendix A.

3.3.7 Our Focus Group Process

When we began the focus group process, it was necessary to first think of who we wanted to participate in our study. Deciding on the participants for the focus groups was done in a similar manner as described in section 3.2.3. When it came to deciding on participants for our focus groups, it was necessary to gain some knowledge into the participants' backgrounds. By learning more about each participant we were able to setup groups based on their backgrounds because we could compare their background with our objectives. It was important that the focus group contain differing views. It allowed for better discussion of the questions, viewable in Appendix F, and helped to form clearer pictures of what participates views were.

It was necessary to come up with a way of contacting the WPI community and informing them of our project as well as to probe for participants. Our group decided to use surveys as recruitment tools for our groups (described in section 3.2.3). This enabled us to reach more people on the WPI campus than we could have possibly hoped to ask personally.

After the participants were decided upon and the groups were scheduled, the next step was to decide how we would record the groups. It was decided the best thing to do was to audio record each session. Logistically this made conducting the groups easier. If it were videotaped in a similar manner as the interviews, it would have been difficult to reserve a satisfactory room and set up a camera to videotape the entire group. Also by audio recording the discussion, it is possible to use interesting material in our final video, although it would only be an audio clip.

Our group then decided how the focus group would be carried out. At this point it was necessary to reflect on the background information we had gathered and to apply what we could. The completed outline appears in Figure 8.

```
I.      Introduction
        a.  Name
        b.  Description of project
        c.  What we hope to get out of this focus group
II.     Humanity And Technology
        a.  Even though technology allows us to connect, is it isolating us in the
            process?
        b.  Will there be a World War III?
        c.  Is technology developed for the social good or corporate good?
        d.  Is humanity technology's master or vice versa?
III.    General Outlooks
        a.  Do you see a possible collapse of society in the future?
        b.  Will technology play a role in this collapse? What factors influence your
            view?
        c.  Will society be able to rebound?
        d.  Will technology play a role in sustaining life?
        e.  Will there be a postindustrial revolution?
IV.     Social Forces
        a.  Which social forces have brought technology to this point?
        b.  Do the benefits we've gained outweigh the risks we've taken in
            developing technology to this point?
        c.  Which will carry it into the future?
V.      Conclusion
        a.  Anything you meant to say but didn't?
        b.  How do you feel this focus group went?
        c.  Did you get something out of it?
        d.  Suggestions for future focus groups and the project in general?
```

Figure 8 - Focus Group Outline

The flow of the discussion was important as well as how questions were phrased. We felt it would make sense to start with broad topics and then to move towards our target topics. The first section was created to introduce everybody and to place all the participants on equal footing at the beginning of the discussion. The following three sections, Sections II, III, and IV, were made to direct the discussion in the areas we were concerned with. Within each section, we tried to follow interesting themes that had appeared in our videotaped interviews as well as other questions we felt were relevant to our study. Within each section, each question was considered and placed intentionally so that the discussion would follow a natural progression. It was important that the questions followed the guidelines that were discussed in section 3.3.3.

The next step in our preparation was to delegate the tasks to members so that the focus groups would run effectively and efficiently. For each discussion it was necessary to have at least three members present to cover all the necessary tasks. Each discussion needed a moderator as well as a group member to watch the recording equipment. A third member was needed to take notes during the discussion. By taking accurate notes, it allowed us to quickly search through the discussion for the material we found interesting and important. Additional members also took notes.

We wanted all the participants to feel comfortable during the focus group. When they arrived at the room, each participant was greeted and thanked for coming to the discussion. Once all the expected participants had arrived, the moderator gave an introduction to the study and explained our future plans for a video production. Then each participant was given an opportunity to voice any concern. After addressing concerns that arose, each participant was asked if they consented to the focus group. After each discussion concluded, all participants were thanked for their participation and informally invited to our final video. A follow up thank you letter was sent to each participant in a timely fashion, similar to the thank you received after the interviews.

3.3.8 Creating the Video

Once we acquired our video footage, it was necessary to take the interview material and pick out the best information we received. This was done by reviewing the videos themselves and the notes that were taken during each interview. From there, we had to transfer all the interview footage onto a computer to be turned into a movie. To do this, we created DVD video discs of each interview with the hope that they would be easier to transfer into the movie creating program. However, this was a step in the wrong direction. The movie program that we used to create the video is Adobe Premier Pro 1.5. The first problem that arose was that we could not import movies from DVD video into Adobe Premier Pro. This caused us to have to take each video and convert it from DVD video into a computerized format that Premier can read, which is an .avi file. This process was extremely time consuming because it took 1 hour for every 15 minutes of video footage converted. The file sizes were also fairly large (about 1 GB per half hour of video) and required somewhere to be stored.

Once all the converting was done, Adobe Premier Pro was able to read the files. Some of the video footage was left on the camcorder tapes, so we were able to connect the camera directly to Adobe Premier, which worked much easier than the conversion. However these file sizes were even larger than the converted files. Next we needed to cut up and organize the video clips that would make up the video. This was another fairly time consuming process. We made an effort to find the best clips and cut them perfectly to get the point across. To find the appropriate clips, we watched each video and discussed together if the clip helped answer our research questions, and also whether it would inform our audience about important topics. We also referred to the note sheets that were used during each interview. This helped in locating some specific clips we wanted to make sure the video encompassed. Once all the clips were cut, we began to organize them by topic and relevance. The relevant ideas we found through doing this are explained in detail in the analysis chapter of our report. The clips were then reviewed one by one to decide on a final order. When a final order was established, we created still images using Windows Paint program highlighting the topics discussed in the video. We imported these files into Premier Pro and placed them in the video where necessary. Next we added transitions between scenes to create a common flow and distinguish between the points being made.

Our final step was to add music and transitions to the areas we saw fit. We chose not to overload the video with music to really be able to understand what the speakers are saying. Once this was done, the final step was to burn the Adobe Project to DVD. The video turned out to be approximately 45 minutes, and took about two and a half hours to burn to DVD. We had to repeat this process three times because of unknown errors the first two times. Once it worked, the final DVD video was ready to be viewed using a DVD player. The total video took up 1.43 GB of space on the DVD disc. The entire project, footage, and music required 28 GB of hard drive space to store all needed files.

CHAPTER 4: SURVEY RESULTS AND ANALYSIS

Originally intended as a recruitment tool for finding participants for interviews and focus groups, our group created a brief email survey and sent it out to the WPI faculty, staff, graduates, and undergraduate students' email lists. The survey was short and simple, asking only five very basic questions; their gender, their overall views of technology, politics, and religion, and if they were willing to participate in a focus group or interview later in the term. The email itself can be seen in Appendix E. The purpose of the survey was to get a general idea of how the members of the WPI community feel about the role of technology in the future while also collecting a small amount of personal data, so that we might identify any correlation between the subject's own beliefs/opinions and how they envision the future. We also hoped that the survey would be a way for us to get a random sampling of the WPI community's opinions, enabling us to reach past our own social circles for interview and focus group participants.

The WPI community for our purpose is the combination of the WPI faculty and staff and the WPI graduate and undergraduate students. By combining the two, our analysis is able to comment on trends within the WPI community. Results showed that there was a prominent Socialist attitude in the population. This attitude bears little influence from an individual's gender, political orientation, or religious preference. This applies to the faculty and staff of WPI as well as the graduate and undergraduate students attending WPI.

4.1 WPI Faculty and Staff

The email was sent out at approximately 12:00 P.M. on October 31, 2005. Within an hour of sending the survey we had already received more than ten responses, which seemed promising. Among the WPI faculty and Staff we received 44 responses after one week. The results were not as diverse as we had hoped or expected, which means that, from our sample, views regarding technology are quite similar. It was our goal to try to find some sort of relationship between a person's political and religious beliefs and their philosophy on technology.

Figure 9 - Philosophical Stance on the Future of Technology Amongst WPI Staff and Faculty
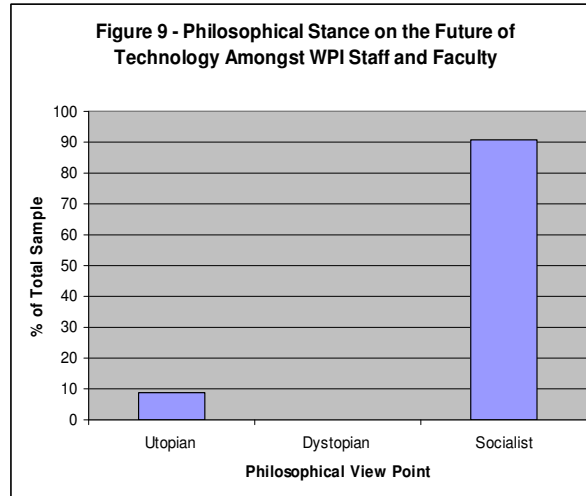
As shown in Figure 9, 91% of subjects chose a Socialist attitude regarding the future of technology. None of the faculty or staff that we polled viewed themselves as a Dystopian. Only 9% of our sample of faculty and staff felt that technology would solve humanities problems.

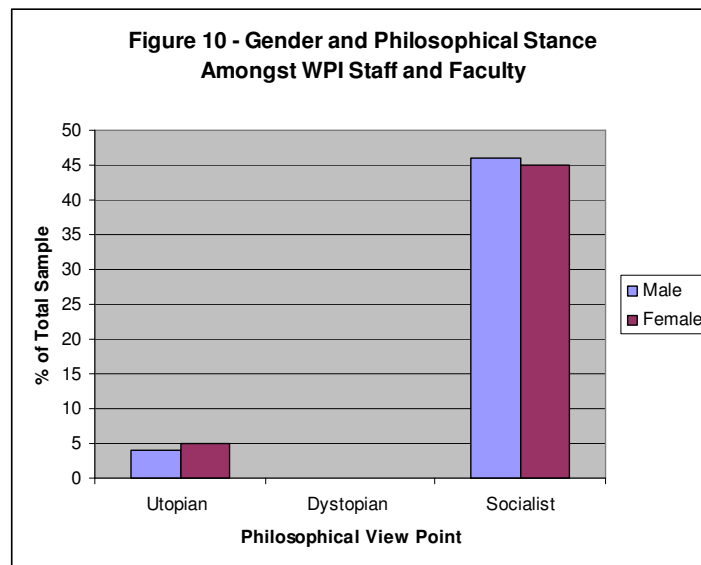Figure 10 - Gender and Philosophical Stance Amongst WPI Staff and Faculty

Figure 10 displays the results of the faculty survey categorized by gender and philosophical stance. 46% of the sample was Socialist males, while 45% were Socialist females. The Utopians were also split by a similar ratio, showing that an individual's gender has little impact on their philosophical outlook on technology.

Figure 11 - Political Views and Philosophical Stance Amongst WPI Staff and Faculty
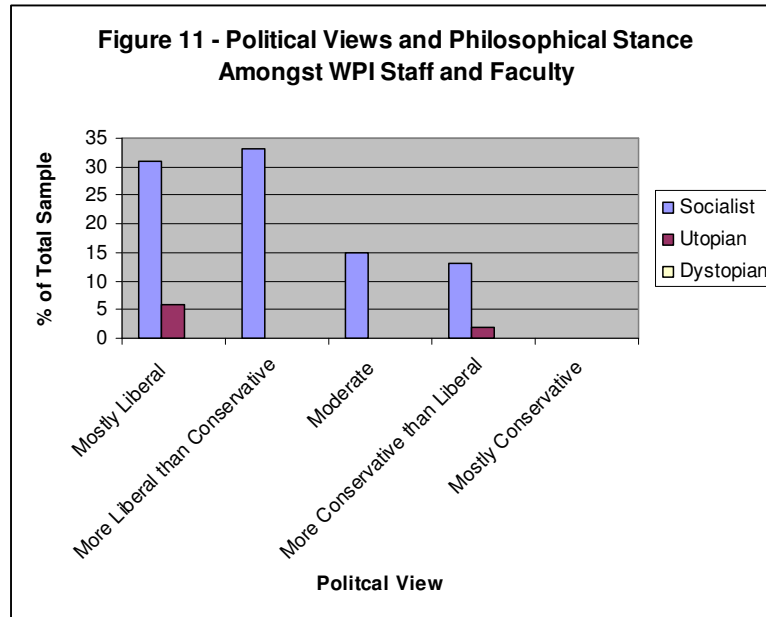
Figure 11 categorizes the data into philosophical stance and political view. In the email survey we asked the reader to choose their political affiliation. Because there is no definition for a liberal or a conservative, their answer to that question was strictly subjective. In other words, view points would have been chosen based on the subject's personal definition of these terms. The technological Socialist attitude was clearly dominant again. Over half of the Socialists classified themselves as liberal. While only 13% of the technical Socialists viewed themselves as conservative. However all of these conservatives believed themselves to have some liberal ideology. Of the Utopians in the sample, most were classified as mostly liberal while a few were more conservative than liberal.

Figure 12 - Preferred Religion and Philosophical Stance Amongst WPI Staff and Faculty
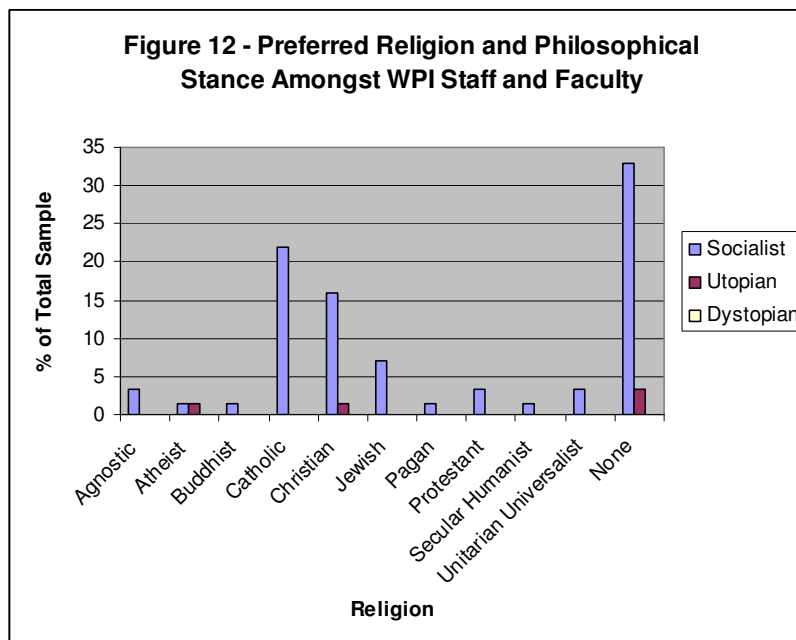
As shown in Figure 12, it is clear that the largest percentage of sample had no religious affiliation. The Christian community accounted for over 35% of the sample with Catholics alone accounting for over 20% of the sample. Beside these three main categories, all other religious affiliation seemed to be diverse with few over 5%. The Utopians, similar to the Socialists, were mainly non-affiliated. A small portion was Christian as well as another small pool of Atheists.

4.2 WPI Graduate and Undergraduate Students

The survey intended for the undergraduate community at WPI posed the same questions as the one sent to faculty and staff so that the results could be compared accurately. The list moderator denied the email survey that was sent to the WPI undergraduate email list. Since the survey was unable to be distributed as intended, the group distributed paper surveys during periods of peak pedestrian traffic on the WPI campus. Group members stood at the fountain on the WPI campus as well as inside the Campus Center. It was expected that we would get few responses in relation to the size of WPI's population, but the group received more results than the 25 responses we had originally hypothesized. By being present and approaching people face to face, we were able to get 33 surveys filled out. By receiving more data than expected, we were able to more accurately analyze the sample.
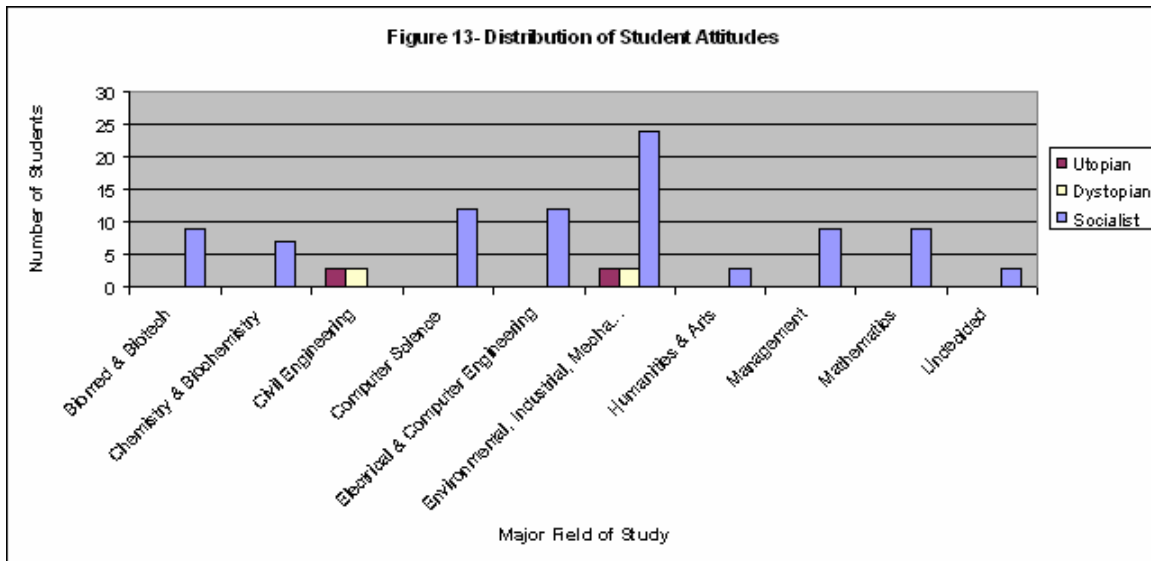
Figure 13- Distribution of Student Attitudes

Figure 13 displays the distribution of the students' attitudes within each field. The only fields with non-Socialists are the Civil Engineering field and the Environmental, Industrial, and Mechanical Engineering fields. The most common field of study within our results was the Environmental, Industrial, and Mechanical engineering group. The least abundant group within our study was the Humanities and Arts group as well as those who were Undecided. Civil Engineering was the only field without Socialists.

Figure 14 - Gender and Philosophical Stance Among WPI Students
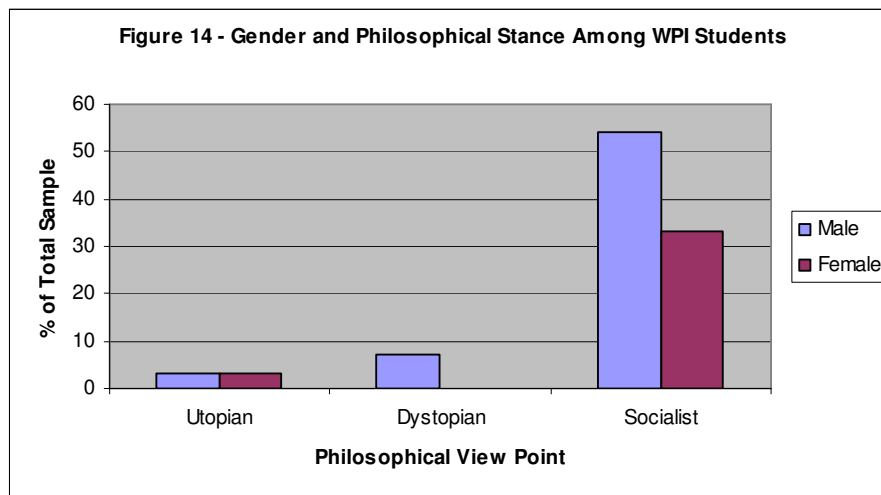
Figure 14 displays the results according to gender and philosophical stance. The Utopians were the least common represented within our results. Within the Utopians, they were split half male and half female. The Dystopians were almost as uncommon as the Utopians. All of the Dystopians were male. The Socialist attitude was the most prevalent stance. 66% of the participants were male, 84% of which were Socialists. 90% of the females were Socialists. Little

correlation was shown between gender and the Utopian or Socialist stance among the student population of WPI, consistent with the results of the faculty and staff survey. Although there were no Dystopians in the faculty and staff survey, the results of the student survey suggest that Dystopians are more likely to be male.
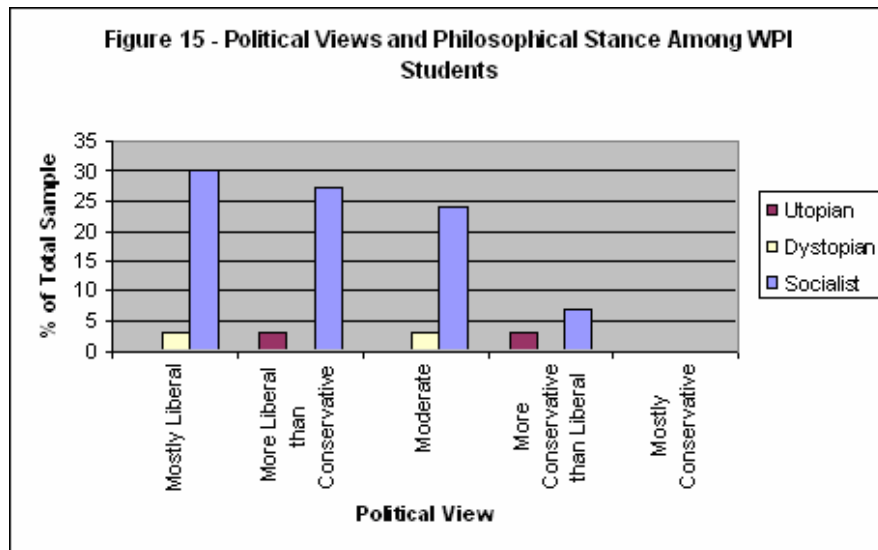
Figure 15 displays the population categorized by philosophical stance and political view. Like the faculty and staff, most of the students, 63%, considered themselves to be on the more liberal end of the political spectrum. The liberals were 90% Socialist. The moderates accounted for 27% of the results and were 88% Socialist. Conservatives, none of whom responded as mostly conservative, were the least common political group, representing only 10% of the sample, and were 70% Socialist.

Figure 16 - Preferred Religion and Philosophical Stance Among WPI Students
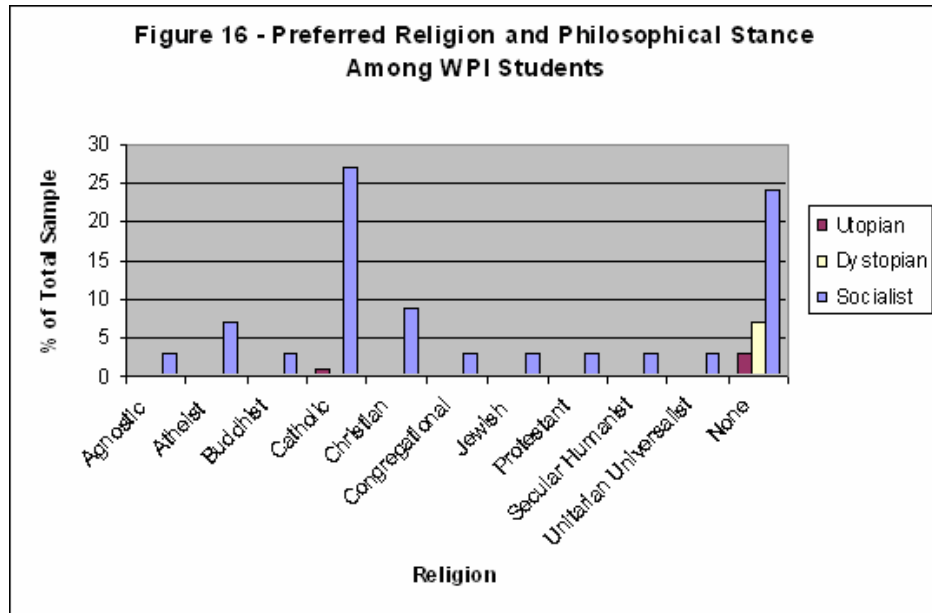
Figure 16 displays the results by religious affiliation and philosophical stance. This is the most diverse group of categories. None of the affiliations represent more than 30% of the results, with the Catholics representing the highest percentage, 28%. Of the Catholic affiliation only one was Utopian. The distribution of religious preferences among the WPI students is very similar to that of the WPI faculty and staff.

4.3 WPI Community as a Whole

Figure 17 - Gender and Philosophical Stance Among the WPI Community
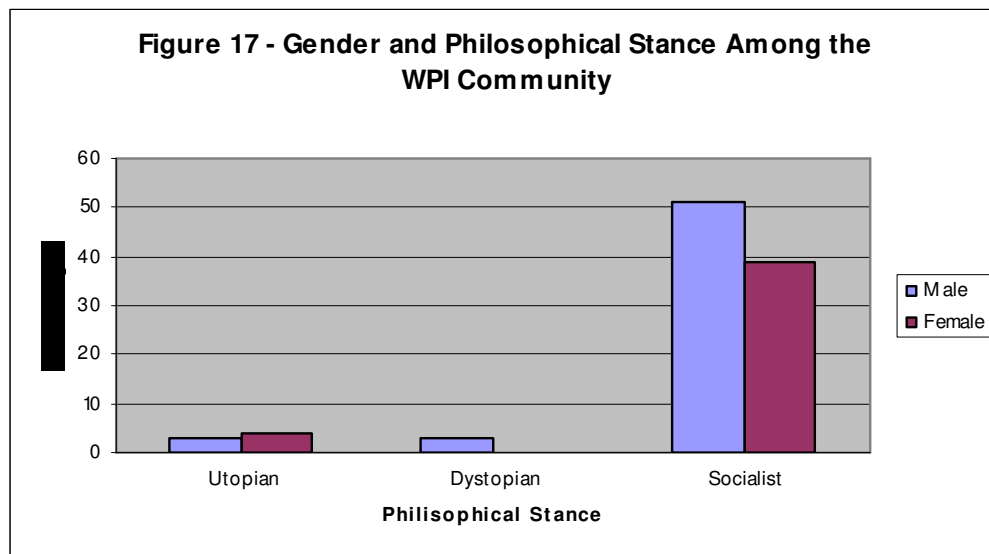
As shown in Figure 17, the Socialist view was dominant in our sample of the WPI community. Among both the student and faculty and staff of WPI, little correlation can be found

between gender and philosophical stance, especially among Socialists and Utopians. The lack of female Dystopians suggests that men are much more likely to have a Dystopian stance than women. There are so few Dystopians in general, however, that it cannot be said conclusively that men are more likely to be Dystopian.
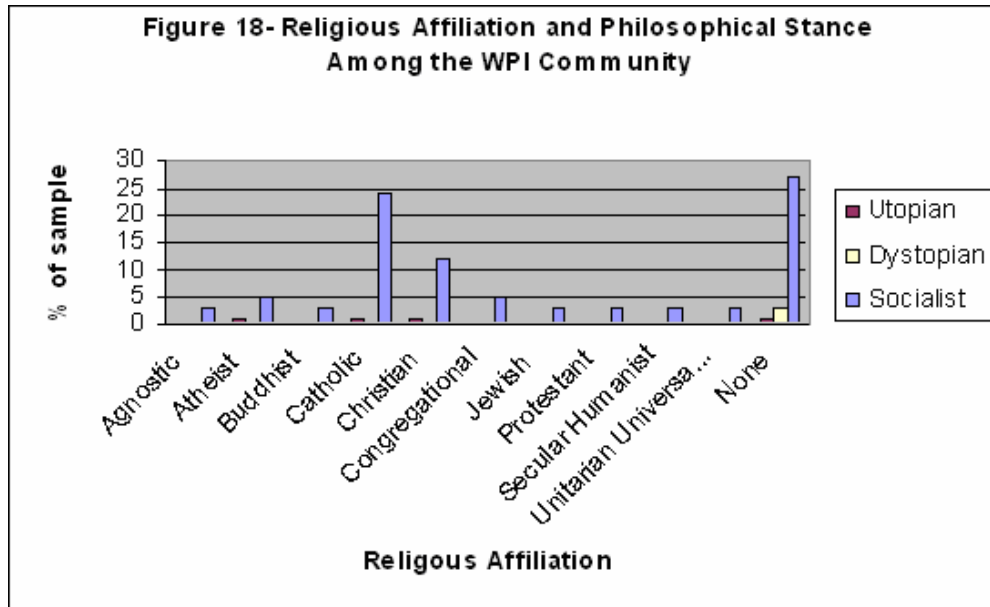
Figure 18 displays the information gathered by relating it to the participants' religious affiliation. The non-affiliated participants made up the majority of the sample although there was a similar number of Catholics. Of all the data collected, religious affiliation was the most diverse. This is displayed well in the graph because few of the affiliations consist of 5% of the population. It is worth noting that all the Dystopians were not associated with any of the religious affiliations.

Figure 19- Political View and Philosophical Stance Among the WPI Community
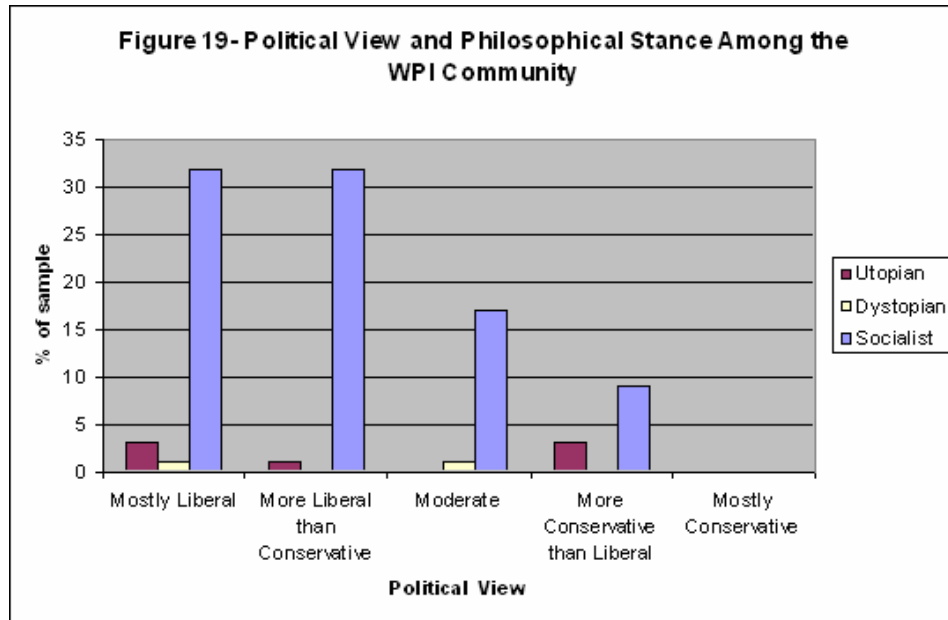
Figure 19 shows the results sorted by philosophical stance and political view. 70% of the sample was considered liberal. Of the liberals, 91% had a Socialist stance. Only 12% of the sample had a conservative stance, none of which identified themselves as Dystopians. All of the conservatives fell under the more conservative than liberal category.

4.4 Survey Conclusions

The survey had two versions. The first version was an electronic copy sent to the faculty and staff of the WPI community. The second version was a paper copy that was passed out to students at the fountain and in the campus center. The student survey didn't meet the requirements to be sent to WPI's undergraduate email list. Unfortunately no response was received as to the infraction. This forced us to modify the survey slightly in order for students to fill it out. Both versions were similar enough so that the results could be easily compiled and analyzed efficiently with respect to each other. It would have been pointless for us to not be able to compare the two groups within the population. After compiling the results, it was clear to see that a Socialist view was prevalent. The email survey that was sent to the students, faculty and staff of WPI suggests that 90% of the WPI community has a Socialist attitude regarding technology. Over 50% of the sample was male technical Socialists. Female Socialists were the second largest and accounted for a third of the sample. Only 3% of the sample identified

themselves as Dystopian. This fact isn't surprising since the population was one with a stake in technologies ability to fix the problems of society. It would have been more surprising if there had been a significant Dystopian trend. The small portion of Dystopians and the few Utopians, 7% of the sample, suggests that the staff and faculty of a technological institution such as WPI recognize that society will ultimately decide which direction technology will take. In some ways, the Socialist view could be considered a combination of Utopian and Dystopian views, making it the "middle of the road" option. It was probably the most popular choice because people tend not to make very radical statements, and try to not lean towards one extreme or the other.

From the results collected, there also does not appear to be any correlation between philosophical viewpoint on technology and gender, political affiliation, or religion. For the WPI community, this seems entirely reasonable. Nearly every faculty member and student has dedicated or will dedicate a substantial portion of their time and effort throughout their lives to technological endeavors. This being the case, it is also reasonable that these individuals have spent an equally substantial amount of time and thought in determining what technology means to them, its importance to humanity, the technological advancements they hope to see and create, and what the impact of those advancements will be. Indeed, the only participant in either our interviews or focus groups to deny having thought in depth about technology and the future was an English professor turned administrator. This suggests that WPI's students, faculty, and staff have invested a large amount of time in thinking independently about technology and its relationship with humanity. This independent thinking is likely to have helped the members of the WPI community eliminate any personal bias regarding technology that they may have held because of their individual gender, political affiliation, or religious preference. This might not be the case with populations outside of WPI and other technologically oriented institutions and organizations.

A possible source of error in our data is that our sample might not have been large enough to get a statistically sufficient spectrum of the viewpoints of the entire WPI community. It is also possible that, because the survey distributed to graduate and undergraduate students at WPI was a paper survey handed out by the members of our group, the data represented by this survey may over-represent the social circles of the group members and not accurately reflect the WPI community as a whole. If the survey had been emailed to the entire graduate and

undergraduate population at WPI, as was originally intended, this bias would have been minimized, if not eliminated entirely. A self-selection bias may possibly arise as a result of our survey methods. In doing the survey for one day in a specific period of time, there was only a particular portion of the WPI student community that we could survey. This was the students that had some reason to be on campus at that time we were surveying. Also, there is a difference between those who chose to take our survey and those who did not. We were more comfortable in asking certain people to take our survey and not others. However, friends of the group members were much more helpful because they actually took the survey unlike several others we asked. The liberal political bias evident in questioning politics suggests that the participants in our survey were similar in that no one classified themselves as conservative. Because the terms conservative and liberal are so general, it is hard to classify oneself as one or the other. This generalization provides possible explanation for the liberally-skewed results of our entire sample.

　　While the data collected by our surveys gives some very general insight into the WPI community's viewpoints regarding technology; it does not allow for these viewpoints to be clearly articulated. This is only possible after in depth discussion with individuals and groups of individuals within the WPI community. This was accomplished through videotaped personal interviews and audio-recorded focus groups.

CHAPTER 5: QUALITATIVE ANALYSIS

In this chapter our results will be analyzed to help us formulate answers to our two primary questions. The focus groups and interviews were conducted to help us understand our objectives. Our two major objectives were to identify;

- What are the differing attitudes toward the future of technological development held by members of the WPI community?
- What are believed to be the social forces responsible for driving technological development?

By following our prepared outlines and by feeling out the direction participants were moving with their answers, we were able to find an incredible wealth of information. Chapter three gives a detailed account of how we gathered the information. Here we will look at our data and apply it to our objectives. The goal of the chapter is to convey all our information in a way that constructively answers our two primary concerns. This chapter will outline and analyze the themes that appeared, as well as try to understand how these themes are related to our background research.

5.1 Preliminary Focus Group Results

As preparation for future focus groups and video interviews, our group planned and conducted a preliminary focus group, whose members were mostly comprised of our acquaintances, who we thought could offer us some valuable insight not only about the future of technology, but also about our project itself. The preliminary focus group was considered a pre-testing instrument but it was also able to give valuable content.

We began the group by presenting background information about our project, and answered any questions they had for us about it. After each participant filled out a consent form, we began recording the session and had them all introduce themselves, state their major, hometown, and intended year of graduation. This was mostly for voice recognition purposes for future reference, but also as an ice breaker for those members that did not know each other prior to this focus group.

The group of questions we discussed was mostly geared towards defining technology and determining what its role in society was. The participants seemed to have quite a hard time defining what technology was because there are so many different types. Based on the results, we rewrote the question into one that was more targeted. After brief discussion, all group members collectively agreed that technology was science applied to life. Most members mentioned that they felt the biomedical industry was rapidly becoming one of the biggest types of technology and will continue to keep getting bigger. Nanotechnology was also mentioned by one of the members as something that will become highly developed in the future. Most group members believed that at this point in time, humanity was still in control of technology. However, it was also brought up that the relationship was likely to reverse roles in the future if drastic reform does not happen. This question caused much debate within the group when discussing which social forces controlled technology (i.e. government, military, a small group of political leaders).

We asked each member of the group to go around the circle and describe, even in a fantasy type style, the way they imagined the future. The results of this were very interesting, because each person described quite a different view. Some members picture the future as being much like an episode of Star Trek. Others picture total collapse and total chaos, like the aftermath of a nuclear war. Another member was optimistic and said he'd like to think the future won't be any different, and that the human race can keep technological advancement under control.

One of the topics we asked the group about was what social forces they believed were currently controlling the development of technology, and what social forces they thought would control it in the future. Roughly one third of the time was spent on these two questions. Many of participants got into intense debates about which forces were in control. We received answers all over the spectrum, from religion and Catholicism, to the government, the military, corporations, political power, and capitalism. Nearly every group member had their own interesting theory. It was very interesting to see how varied the opinions of the participants were. Many of them were very passionate about their own ideas and theories. This was exactly what we were hoping to see. We wanted to evoke some response from the participants and really get them thinking about the questions we were asking them.

The last questions we asked the focus group were how they thought the discussion went, and if they had any suggestions of how to improve it. All participants agreed that the questions we asked were relevant and thought provoking, but because some people were talking much more than others, the group suggested that we pose questions directly to the quieter people to evoke responses, or even go around in a circle and have all the participants say their piece. They also suggested that we try to locate a digital recorder so that we wouldn't have to fumble around with tapes in the future, or worry about them running out and missing any good material. The discussion went close to how we expected it would. We considered the suggestions for improvement the participants made along with comments made by the team. The suggestions and comments and our observations helped us make adjustments to perfect the process for the next focus group. We did not anticipate the discussion would take as long as it did, so in future sessions we allowed more time for discussion. Overall this focus group was successful and beneficial to us all. We were able to gain experience and practice in running a group and asking questions, and we also got some valuable feedback about the topic from trusted peers.

5.2 Interview Results

Between October 20, 2005 and November 12, 2005, our group conducted 18 videotaped interviews that were approximately 30-40 minutes each. The interviewer asked questions first about our particular areas of concern (biotechnology, nanotechnology, artificial intelligence, etc.) and then opened the floor for the interviewee to talk about topics of concern to them. While many of the interviewee's chose to talk about our topics, some opted to talk about other areas of technology such as green power, agriculture, the internet, and even philosophy (Figure 20). The ideas presented in each and every interview were unique, helpful, and interesting to everyone in our group. It became obvious very quickly that the field of biotechnology, specifically genetic engineering, was a very concerning issue to most of the people we interviewed. Most of the interviewees indicated that both good and harm could come from biotechnology. They expressed both hope and fear, hope that biotechnology could be used to improve the quality of life, and fear of what unnatural creations could arise.

Figure 20 - Topics of Concern and Frequency of Discussion in Interviews

- Genetic Engineering — 36%
- Nanotechnology — 22%
- Artificial Intelligence — 10%
- Alternative Energy — 9%
- Internet — 9%
- Agriculture — 9%
- Other — 5%
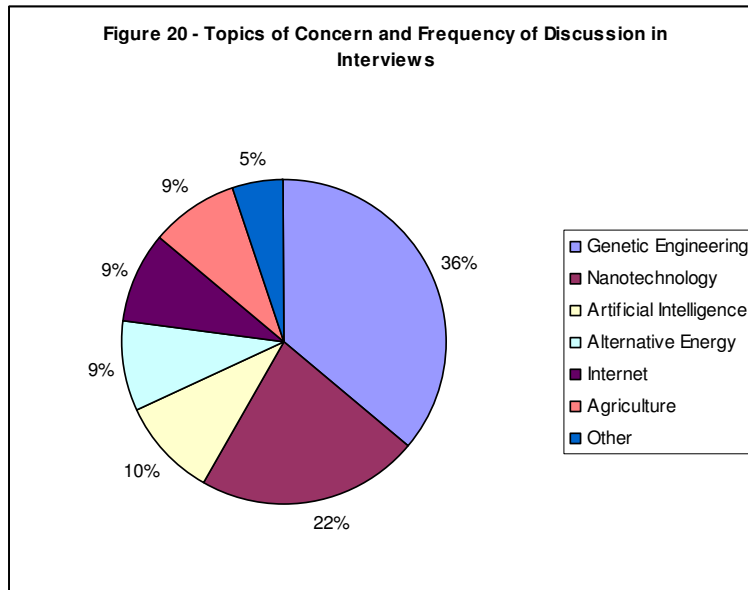
5.3 Focus Group Results

There were two focus groups conducted to expand on the information gathered through interviews. The first group discussion was done with six WPI undergraduates. There were mixed views towards technology but similar feelings about what is driving technology. Many found it unclear as to when our technological advancement will end, believing that it has no boundaries. Again, the neutrality of technology and its embedded politic was discussed. They told us that we control the direction of technology, but that capitalism drives the push to develop new technology. It was mentioned that often we develop technology to fix preexisting and problematic technologies. This type of technical fix was seen by the group as only causing more problems. Examples of this issue are presented in the video, as well as the ideas about technology's politics. One student said that there cannot be infinite growth in a finite system. The general finding in discussing this was that we are going to run out of our finite resources, the most crucial being our current forms of energy and energy systems. This is another topic that was discussed in interviews as well, and is shown to be a serious concern of the future.

The second focus group consisted of three WPI faculty and staff. This discussion was a bit different than the first. One faculty member told us that he never cares to think about the future or technology's role in it. Another was pleased that stem cell research is being done,

which we had yet to hear from previous subjects. It was also said that technology gives us more choices, but it is our choice to use technology or not. In terms of new technology, it was mentioned that there are new etiquettes for the use of new technologies. In probing the future, it was said that anything is possible, but those that would survive the longest are those who are less technologically dependent. The important thing in doing these focus groups was to get people talking about these topics. We hoped that our video would have a similar effect.

5.4 Interview and Focus Group Analysis

This portion of our report analyzes the major themes that were established through our study. We found seven specific themes that allow us to both understand the ideas explored through our research questions and relate our findings to previous research. Overall, attitudes towards technology in our study can be grouped in terms of Bernard Gendron's classifications, with focus on particular attitudes more than others. Ideas of risk in developing technology were similar to the social and cultural implications presented in <u>Social Theories of Risk</u>. The specific technologies presented in our background research were all seen as having both potential for great benefit and significant risk. Attitudes towards specific technologies were found to be related to overall attitudes toward general technological development. The political views of participants were similar depending on these attitudes as well. Further insight is also provided to explain and analyze what we found that wasn't discussed in the background.

Technology versus Nature

In the interviews and focus groups the idea of domination was mentioned quite frequently.

> All of the technologies that we have today…are premised on that one fateful choice. Which is to say that nature has no intrinsic value, except as an instrument for our use. *(Anonymous)*.

Many participants viewed technology as a way for us to dominate our environment and each other. Most of the American society has chosen to take advantage of nature. Technology was defined by one participant as the manipulation of nature to give us some sort of advantage that previously didn't exist. The plastics industry is an example of this domination. Researchers

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realized that we could create plastic from oil and now we have nearly exhausted the supply of oil. "Oil is our chief resource. It is in everything we do" (*Anonymous*). Many of these plastic products can't be reused or broken down which ultimately destroys our environment. We have essentially modified all other forms of life and used it for our own benefits. The idea that this practice is acceptable, many of our participants believed, will lead us to some disaster or apocalypse.

> We derive our view of the universe as mechanistic and intended for human use. All of these things…are rooted in our culture, and you can go back and see how these ideas have progressed, where we see a forest as board feet of lumber *(Anonymous)*.

Since these practices have become common and acceptable, it is hard for society to break away from them. This is another example that shows how difficult it is to create change within society. Technology is not completely accountable for this inhibition to change. The direction of technological development is affected by those who are in power as well as those who are representing our society. The pace at which we are destroying the earth and using up its resources is reflective of how those making our life decisions lack a real appreciation for nature and what it has to offer without manipulating it for our personal interests. It is hard to say if a world without manipulation of nature is possible in the current world we live in.

> If we want to develop appropriate technologies that humanize us and humanize nature in the sense of making nature into a subject not an object, we would really need to think outside the paradigm of domination. But because capitalism depends on these new technologies, it's very hard to do because all of the profit incentives are towards further manipulation of the genetic code, further co modification of life, further reduction of all living things to mere matter *(Anonymous)*.

Because of the current capitalist system that exists, it seems extremely hard for a few people to make change on a major level. Our sample hopes that society will realize that this domination of nature is causing problems with our environment and that they will do something about it. One of the best ways to help people realize this is to inform them. Our video documentary is instrumental for informing people about these technological issues of today.

Pessimistic Domination

One of the most interesting findings from our research is that our sample of WPI had close to no students, faculty, or professors with a Utopian view of the future; most favored a Technological Socialist perspective. To recap, a person with a Utopian view believes that most social problems can be fixed by technology. A Technological Socialist believes that technology has the ability to either help or hurt society depending on how it's used, and that technological change is not the only advancement needed to survive. The classification of Technological Socialist is undoubtedly the broadest one, which seems logical as to why there were a significant number of people in our sample who we classified under this category. "It's not that there's any inherent physical or conceptual obstacle, it's simply that social change of any kind is difficult, political change of any kind is difficult" (*Anonymous*). Our sample's choice to exemplify how technology is not the only entity necessary for our advancement shows that they are classified as Technological Socialists. Some of those we believed were Technological Socialists showed views of both Classical and Countercultural Dystopic ideas that emerged from the study. Much like a Classical Dystopian, it was mentioned that "if these new developing technologies are controlled by those that are power hungry, then the grip on society will only become tighter and people will lose more of their privacy and freedom" *(Anonymous)*. The idea that these technologies could be used to control people is evidently a fear that some have. The Countercultural Dystopian view is exemplified in the following quotation from our video:

> The more we have technology controlling the physical world around us that increases the separation between us and the physical world. The more we get separated from the physical world, the more we get disconnected from each other (Anonymous).

This idea of separation in culture represents how technology is changing our minds and how we do things. Another participant mentioned how technology like calculators and spell-check program features are "biting away at our ability to be autonomous independent thinkers, to be able to argue with each other about the life and death issues of our society" (*Anonymous*). Again, it can be seen that technology is changing how we do things, as well as how we think about things. This type of problem with technology was seen by our participants as something that will continue to exist in the future if the direction of technological development does not change significantly.

When you go to college and choose an area of study, it is intended that you will be completely immersed in it, and will continue to be for the rest of your working days. It is interesting that so many people would choose to pursue a career in something that they believe has the ability to hurt society. From a moral standpoint it is peculiar, and illogical that a person would devote the rest of their lives to technology, from which they only see a possibility of problems arising. We expected that people who are so involved in technology would believe that the pursuit of its advancement is entirely noble, but this is obviously not the case.

Instant Communication has Disconnected Society

Many of the subjects in the interviews struggled with trying to understand the point of technology. Was it to make our lives easier? Why do we want easier lives? What is it that we need all this free time for? Many people are working hard to develop new technologies and better existing ones that allow for quicker communication and more connection.

> As we've sought this greater control over out environment, the result is actually that we've worked more and more, harder and harder, and had less leisure time, and less time actually spent in communion with each other (Anonymous).

The ideas that technology should make us more connected and allow us more free time does not relate to technology's current trend. With new communication technologies, many people will also opt to use their cell phone or instant messenger instead of having a face to face conversation. The quality and value of the conversations we have decrease with the increasing numbers of mediums to communicate in. It is as though increasing connectedness is actually causing us to become disconnected with each other. It is unnatural that we stare at a screen to speak with somebody when it used to be common practice to visit that person.

Communication technology is not the only thing separating us from each other and our world. "Instead of getting together on an evening and hanging out and singing songs together, we watch TV. There's much more private experience." (*Anonymous)*. Technology seems to be enveloping personal experience more than collective experience. Thinking back to the time of the Agrarian Society, everyone was part of a group. Technology wasn't needed because groups would get together to perform cultural rituals and create art. In the face of this current capitalist system, technology has become such a commodity that it has disregarded collective meaningful experience. Is it possible to break away from something that has taken over so much of our lives?

"We're going to have to have it be facilitating of connections and meaningful experience or this sense of alienation and isolation is will lead people who are now empowered in ways they weren't before to do catastrophic things" *(Anonymous*.) It seems that technology is always going to grow. The direction of technological development is ultimately what will determine how people react to each other in the future. It is obvious that if we continue development in our current trend, it is likely that humans will be very separated from each other. Changing the direction of technology is not an easy task, specifically because of corporate incentive.

Corporate Good versus Social Good

One of the primary social forces driving the development of technology in the United States is capitalism. Many corporations are inclined to develop products based on profit projections, as opposed to their actual function or usefulness in society. "Now you have to specific aim, you have to have a specific goal, and it has to be proven to be profitable. And I think that rules out a lot of discoveries that could potentially be made" *(Anonymous)*. Unfortunately, because all of these luxury items are pushed to market, more important and functional items that would be less profitable may not reach production. As one of the interview participants so eloquently stated, "there is a reason we have six different kinds of Viagra but don't have a cure for AIDS yet." This reason is because the corporation must create a product that makes money. There is a significant difference between something like a cure for aids and the enhancement of bodily function. It was stated that "the argument you have to look at when considering any biotech innovation is 'is it something that is fixing a problem or is it something that is enhancing a situation.' I think if we concentrated on treatment rather than enhancement, it will minimize our risk" *(Anonymous)*. Today it is more profitable for a company to create medication that helps fix people's problems rather than cure them of their ailments.

It is not just pharmaceutical companies that prove to be driven by money and capitalism. One participant mentioned how "there are a lot of people developing these cell phone tunes and it's a billion dollar industry. At the same time some charitable organizations can not get computers for the office… that is because of the commercial drive" (*Anonymous*). Again, it is apparent that money has a huge influence on how technology is utilized. Thinking about the future, we wondered if it was possible that this capitalist consumer drive would change for the

better. A participant told us that "if we were to change the way that capitalism works or change or economic system, then certainly our entire outlook on technology and development would change…they're kind of intertwined in the sense that you can't change one without the other." It is evident that major change will need to occur for the technological development to separate from capitalism. An inherent problem is that society as a whole has come to trust technology more than ever before, so it is hard to see change for the better.

Trust in Technology

Our personal experience has lead us to believe that the majority of American society trusts technology. People will fill their houses with all the gadgets created to do something for us, but may not necessarily know of the other technologies being developed that could be potentially dangerous. Our sample believes that it is not the technology itself that is dangerous; it is how we use it and who decides how we use it that is questionable. Up to this point, regulating the advancement of technology has proven a difficult task. It is hard to know where to begin: "Who should do the regulating… and what are the principles that guide you? Depending on your world view and where you stand, you're going to have a different perspective" *(Anonymous)*. Because of many different perspectives, it is hard to say how regulation should be done. Each individual has their own personal interests and views of risk. As learned in background research, one will see risk differently depending on their position in technological development. In our study, those working in technological fields felt that the potential risks in developing these new technologies was just as significant as the potential benefits, while those not working in technological development were strong-minded about the threats that these technologies posed. In relation to the social risk perception in our background research, our sample of technologists was both fearful and hopeful for new technology, but they didn't favor technological development because of its direction. Participants who were not technologists saw the benefit and risk, but were very critical of its development because of what has been developed and how it has been developed today.

The main financial providers of technological research were found to be the government and private corporations. "No one will tell you that the academic community or the scientists are the people who really know what's going on, or have the vast majority of control over their

work. It's not true, and it's not true in major areas of research" *(Anonymous)*. The reason these groups do not have control over their work is because they are being paid to do work for these financial providers. One participant stated that "the fact that technological innovation is essentially driven by money, there's almost no other way to get significant research and development done besides having a whole lot of money." Today, those with the most money are usually involved in big business. It was also mentioned that many of these people involved in big business often go into politics and become major decision makers. This is exemplified by our current political situation: "There's no coincidence that we have a president and vice president that came out of the oil industry. We regularly go to war around maintaining oil flows…The access to oil is a crucial dimension" *(Anonymous)*. It was stated before that oil is our most significant resource particularly for energy. Therefore there is an extreme amount of money being put into the maintenance of oil systems. This idea that our current political elites came from the biggest money-making industry in the world suggests that these are the people with the most power to decide how technology will develop and how it will be regulated.

It was very obvious in most interviews and focus groups that people had a general distrust for the government and its ability to be in command of such a task: "Clearly if we say should the government do it, we can look at so many botched things the government has done" (*Anonymous*). This type of comment was prevalent through our sample. We believe that because none of our subjects are politicians, they tended to be cynical towards our government. Political perspective was seen to affect views towards technology. Those who were critically minded about the government did not see benefits in technological development controlled by the state. However, those who did favor the government were skeptical about these new technologies. Although our subjects had distaste for the way technology is currently being regulated, they were unable to hypothesize an alternative. They agree that it should be a democratic process, but deciding on which organization, party, or group of people get a say remains undetermined.

> There needs to be controls, self-controls, and collective controls, and conditions and direction to these kind of technologies, that will have to come out of some very rich conversation about their potential implications*(Anonymous)*.

It is clear that the people developing the technology should have an influence when deciding how that technology would be released and controlled. Many then proceeded to add that it was unlikely to ever be this way because of our current government and the systems of

regulation. Although regulation was seen as a significant factor in future technological development, participants were more concerned with technological issues of the near future rather than the distant future.

Unsustainable Progress

In one of the interviews a subject asked us, the interviewers, to think about what life is like today, and to compare that to what life was like just 100 years ago. To think about the colossal progression of technology in such a small amount of time was indeed a profound thought to grasp. This individual, along with many others, imagines that the advancement of society is on an exponential curve that is probably not sustainable for much longer. You can't have infinite growth in a finite system *(Anonymous)*. The rate at which we are consuming our natural resources - mainly natural gas and petroleum - is so great that our supplies are rapidly depleting. As a society we are dependent on energy for everything. While alternative energy sources exist, nothing has been developed that can come close to meeting current energy demands. Not only this, but it was mentioned that changing to renewable energy sources is not profitable, and because the oil business has so much money invested in it, little has been done to break away from this current trend. When speaking with a participant about the depleting resource situation, it was understood that "the optimist would say that as prices go up, alternatives become more cost effective…but I question the ability not only to bring those alternatives on line in time, but to do it in the face of these depleting resources." Because of this crisis, many envision an unavoidable "crash" in society. They foresee an economic depression due to resource shortages that may be hard to overcome. Aside from a depression, other social aspects would be affected. "We're facing a big problem in the near future. It's a big problem because without energy you can't ship food, you can't make plastics without oil, and you can't treat people in hospitals. If we allow our energy to run out, I don't think anybody really knows how bad the consequences are going to be" *(Anonymous)*. A large loss of life could result if other resources aren't developed soon. It is very hard to determine whether enough people will become aware of this problem, there is only the hope that we will continue to inform people about these issues and that they will inform others.

The Patch Problem

From the research, it was evident that our respondents believe society often uses technology to patch or fix the previous problems that have arisen from previous technological innovations. This has created a cycle that has become inherent in society. An example of this idea stated in interviews was traffic radio. This particular participant believed that we use traffic radio technology because we have an irrational transportation system in which people are killed daily. It was also stated that because of automobile technology, we are now having more severe environmental problems due to greenhouse gas emotions. A possible fix for this that was mentioned in an interview was using nanotechnology to rebuild our ozone layer. There are significant problems with nanotechnology that could arise if we let tiny machines out into our atmosphere. It is apparent through our research that technology is constantly creating problems and we constantly need to come up with new technological fixes to these problems. But where are we going with it? One reason for doing this project is to raise awareness that this cycle exists and is pushing to continually expand and develop. It was stated that in many corporations it is accepted that innovations have some negative effects: "We constantly see recalls on automobiles, and this is just one example of how technology is not perfect and probably never will be" *(Anonymous)*.

Despite all of this pessimism towards our future, it is evident that people still have hope. So many people are naïve to the fact that there is even a problem. Most of them don't even realize that we may be on the brink of a recession. In the face of all this ignorance, our interviewees expressed faith that society will realize our dilemma, and actively do something about it.

> Whatever happens with technology in the future, people are going to make it through it. We just have a way of doing that. People will survive, and how they survive and what it's going to be like in the future and what we're going to depend on is what we should be thinking about. (*Anonymous*).

The only way to get people to think about these topics is to make them aware of the situation. Through our time spent on this project we have all learned a great deal about these topics ourselves. Our efforts to inform people are necessary to make a change.

5.5 Conclusions

Cutting down hours and hours of interview footage into a 45 minute video proved to be a most difficult task. We knew that all of our hard work would be worth it in the end though, because we have created a movie that can be used in many ways. It can be taken for face value, simply as the response to the question we posed in the beginning; how does the WPI community see the future of technology? Or, it can be taken much, much farther. It can be used as an informative video about the risks of technology. It can be used as a tool for discussion about this topic. Most importantly it can be used as a tool to provoke thought about the future of technology, and make people realize what an important issue it is. Many have never even thought about what might happen in the future, and if nothing else we hope the video stirs them to.

Engulfing ourselves in this project for a whole semester most definitely stirred all of us. The project was both extremely rewarding, and a source of most frustration. Our group became emotionally involved in this project, and would sit around for hours theorizing with each other about how excited or discouraged we were with the state of the world, and how we planned to do something about it by changing things in our own lives. For most of us this project turned into more than just a graduation requirement - it has become a life lesson. This project has changed a lot of us, and made us realize how important it is to stay informed about what is going on in the world. Being part of our society, and fundamentally a creature of the earth, we must always be conscious of our actions, and we must encourage others to do the same. Many are willing to turn a blind eye to some really pressing issues simply because they are preoccupied or do not care. How can you turn a blind eye to your future? If there is a problem, we as humans must bind together and do something to fix it if we hope to make it through our lives, and preserve the quality of life for future generations. All of the members of our group are committed to spreading the insight we have gained from this project to those around us.

In the future we hope that another group will elaborate on the results that we have obtained through our research. Ideally we would like to see the project done on a larger scale, perhaps in the city of Worcester. It is important that a city as industrialized as ours comes to terms with technology and how it will affect our future. Informing people can only help the cause.

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Appendices

Appendix A: Preliminary Focus Group Outline

Preliminary Focus Group Questions

Introduction

a. Name, Majors, Ages, Graduation Year, Hometown

b. Description of project

c. What we hope to get out of this focus group

Humanity And Technology

d. What is technology?

e. What technology is being developed today?

f. What role does it play in society?

g. What role should it play in society?

h. Is humanity technology's master or vice versa?

General Outlooks

    i. Will technology help or hurt the future?

j. If the future were a science fiction movie, what would it involve?

k. What technologies do you think will help humanity in the future?

l. What technologies do you think will hurt humanity in the future?

Social Forces

m. What social forces have brought technology to this point?

n. Which will carry it into the future?

o. Who will control the direction of technology in the future?

Conclusion

p. Anything you meant to say but didn't?

q. How do you feel this focus group went?

r. Did you get something out of it?

s. Suggestions for future focus groups and the project in general?

t. Would you be willing to participate in future focus groups and individual video interviews for this project?

Appendix B: Preliminary Video Interview and/or Focus Group Consent Form

Apocalypse Soon?

IQP Video Interview and/or Focus Group Participation Consent Form

You are invited to be in a research study about the relationship between humanity and technology, and their likely relationship in the future. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by: Paul Ferreira, Daniel Goldberg, Dani Martin, Rachel Robillard, and Daniel Waitt, students at Worcester Polytechnic Institute, as part of their Interactive Qualifying Project.

Background Information:

The purpose of this study is:
> To discuss the connections between humans and technology.
> To see if people have a generally optimistic or pessimistic outlook for the future of technology.
> To determine which social forces are driving the development of technology.

Procedures:

If you agree to be in this study, everything you say during the video interview and/or focus group discussion will be recorded, and written notes will be taken for future reference. The entire procedure is projected to take no more than 2 hours, and you may leave at any time.

Confidentiality:

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will only be shared for research and discussion purposes.

If you participating in a focus group:
> ? I consent to the audio recording of this focus group.
> ? I consent to the quotation of any material recorded from the focus group to be used in a report or video documentary.

If you are participating in a videotaped interview:
> ? I consent to have my interview videotaped.
> ? I consent to my interview being used in the video documentary.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Worcester Polytechnic Institute. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researchers conducting this study are mentioned above. You may ask them any questions you have now. If you have questions later, **you are encouraged** to contact them at videoab05@wpi.edu.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

_____   _____

Signature   Date

_____   _____

Signature of Investigator   Date

Appendix C: Email to Professor

Dear Professor,

   We are working on an IQP entitled "Apocalypse Soon?" which involves interviewing members of the WPI community about technological issues and we are particularly interested in your opinion. Our main objectives are to find out people's attitudes towards the future of technology, how people relate to technology, and which social forces are behind its development. Please let us know if you would like to participate in a 30 to 60 minute video-taped interview. We will be conducting interviews from Wednesday, October 19th through Sunday, October 23rd between the times of 11:00AM and 6:00PM over the fall break. If this does not work we will be conducting interviews into the term. We look forward to hearing back from you. Thank you for your time.

Sincerely,

Paul Ferreira
Daniel Goldberg
Dani Martin
Rachel Robillard
Daniel Waitt

Appendix D: Videotaped Interview Note Taking Form

Videotaped Interview Note Sheet

Subject Name: _____

Date: _____

Time: _____

Location: _____

Interviewer: _____

Camera Person: _____

Secretary: _____

Time	Question	Response	Key Points	Other Comments

Appendix E: Candidate Email Survey

Which of the following three views bests fits your own?

    a. Technology will primarily benefit humanity. It will eventually solve all social, political, and economic problems currently facing the world.

    b. Technology will primarily hurt humanity. It will only create more social, political, and economic problems and will eventually lead to world war and/or the collapse of civilization.

    c. Technology has the capacity to both benefit and hurt humanity, depending on how society chooses to use it. Revolutions in politics and society must take place in addition to the advancement of technology for a successful future.

Politically do you consider yourself:

    d. Mostly liberal

    e. More liberal than conservative

    f. Moderate

    g. More conservative than liberal

    h. Mostly conservative

Are you:

    i.   Male

    j. Female

What is your religious preference:_____

I would be willing to contribute my ideas about the development of technology and the future of humanity by participating in a video-taped personal interview and/or focus group early in B term.

    k. Yes

    l. No

Appendix F: Focus Group Outline

Introduction

u. Name

v. Description of project

w. What we hope to get out of this focus group

Humanity And Technology

x. Even though technology allows us to connect, is it isolating us in the process?

y. Will there be a World War III?

z. Is technology developed for the social good or corporate good?

aa. Is humanity technology's master or vice versa?

General Outlooks

bb. Do you see a possible collapse of society in the future?

cc. Will technology play a role in this collapse? What factors influence your view?

dd. Will society be able to rebound?

ee. Will technology play a role in sustaining life?

ff. Will there be a postindustrial revolution?

Social Forces

gg. Which social forces have brought technology to this point?

hh. Do the benefits we've gained outweigh the risks we've taken in developing technology to this point?

ii. Which will carry it into the future?

Conclusion

jj. Anything you meant to say but didn't?

kk. How do you feel this focus group went?

ll. Did you get something out of it?

mm. Suggestions for future focus groups and the project in general?