DID I BUY THE WRONG GADGET? HOW THE EVALUABILITY OF TECHNOLOGY FEATURES INFLUENCES TECHNOLOGY FEATURE PREFERENCES AND SUBSEQUENT PRODUCT CHOICE

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Appendix A

Exploratory Pilot Study One: MS PowerPoint Versus MS Visio

Study Context

Both MS PowerPoint and Visio have functions to draw diagrams. We drew on task–technology fit (TTF) to identify easy-to-evaluate and hard-to-evaluate features for these two IT products (Goodhue 1998), and two features were chosen: locatability and flexibility.

Locatability was defined as the "ease of determining what data is available and where" (Goodhue 1998, p. 131). Here, locatability reflects the ease of determining what diagram types are available and where these can be accessed by the user; locatability can therefore be evaluated based on the time spent searching for relevant diagram types. For example, if people spend 10 seconds on average to find a specific diagram type, 10 seconds would be viewed favorably when compared to 20 seconds, but perceived unfavorably when compared to 5 seconds. Thus, we believe locatability to be a relative hard-to-evaluate feature; that is, without comparison, its worth cannot be easily evaluated.

Flexibility was defined as the "ease of changing the content or format of the data to meet changing business needs" (Goodhue 1998, p. 132). Here, flexibility reflects the ability to complete different drawing tasks. Thus, flexibility is evaluated based on various drawing capabilities (e.g., lines, boxes, grids, and so on), not the number of diagrams per se. We believe flexibility is a relatively easy-to-evaluate feature; that is, even without comparison, individuals can quickly discover whether a technology can help them finish a diagram development task.

Thus, using the EH framework, Table A1 contrasts MS PowerPoint versus Visio. When using PowerPoint to draw diagrams, individuals can access all diagram shapes by clicking the "Shapes" button under the "Insert" ribbon. Therefore, PowerPoint's locatability is relatively high. However, the availability of different types of diagrams is relatively limited, and PowerPoint can only support relatively simple diagram

drawing tasks. For Visio, individuals can access different shapes by viewing different templates, or selecting one template from the "Shape" option under the "File" menu.[1] Various templates of Visio can be used to draw a vast array of diagrams, allowing Visio to easily draw relatively complex diagrams. On the other hand, individuals using Visio likely may not know the array of shapes available under a certain template before its selection, possibly having to switch between templates to find a particular shape or diagram type. Thus, Visio's locatability is relatively low when compared to PowerPoint.

Table A1. Exploratory Pilot Study 1: MS PPT versus Visio		
	Locatability (Hard-to-Evaluate Feature)	**Flexibility (Easy-to-Evaluate Feature)**
PowerPoint	Relatively High	Support Simple Drawing
Visio	Relatively Low	Support Complex Drawing

Applying the EH suggests that when evaluating either PowerPoint or Visio in isolation, individuals will be more likely to perceive flexibility (i.e., an easy-to-evaluate feature) as being more important. However, when evaluating both, they can compare PowerPoint to Visio on locatability (i.e., a hard-to-evaluate feature). Therefore, locatability will probably be perceived more important. *Thus, PowerPoint will be viewed more positively when jointly compared (H1), while Visio will be viewed more positively when evaluated separately (H2).*

Sample

The participants were from a college-wide, entry-level business class at a large public university in the northwest region of the United States; 220 students participated in the study. Participants' average age was 19.91 (SD 1.82), and 33.64% were female. About 1% of their final course grade was provided for participation in the experiment.

Measures

The *technology evaluation* measure was developed by following the guidance from the extent literature (e.g., Dishaw and Strong 1999; Venkatesh et al. 2003). *Technology experience* was collected to access participants' backgrounds. Each item was measured using a seven-point Likert-type scale (1 = strongly disagree, 7 = strongly agree). A complete list of items is provided in Appendix C.

Task and Experimental Procedure

The task asked participants to imagine that they needed to draw a "key personnel" structured diagram for a company that included multiple departments.[2] A pre-test indicated that most students had not used MS Visio before, and were unfamiliar with MS PowerPoint's drawing feature. As a result, video tutorials were created so that participants could more objectively evaluate the two technologies.

After arriving at a computer classroom where the study was administered, participants were briefly introduced to the study and then directed to a secure website to fill out a short background questionnaire. Following prior EA research, participants were randomly assigned to one of three groups (see Figure A1). Group 1 was presented with an overview and video tutorial of Visio, followed by the evaluation survey. Group 2 was presented with an overview and video tutorial of PowerPoint, followed by the evaluation survey. Group 3 was presented with both the Visio and PowerPoint treatments as applied in Group 1 and 2 (in counter-balanced order), followed by the evaluation survey for both technologies.[3]

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[1]Note that the data collection was conducted with MS Visio 2007.

[2]To fairly test the EH, prior research has carefully selected the items of comparison. As such, here we chose a generic drawing task that would be commonly completed by either PowerPoint or Visio.

[3]There were no order effects in Group 3. Therefore, we did not further divide Group 3 in the subsequent analysis.
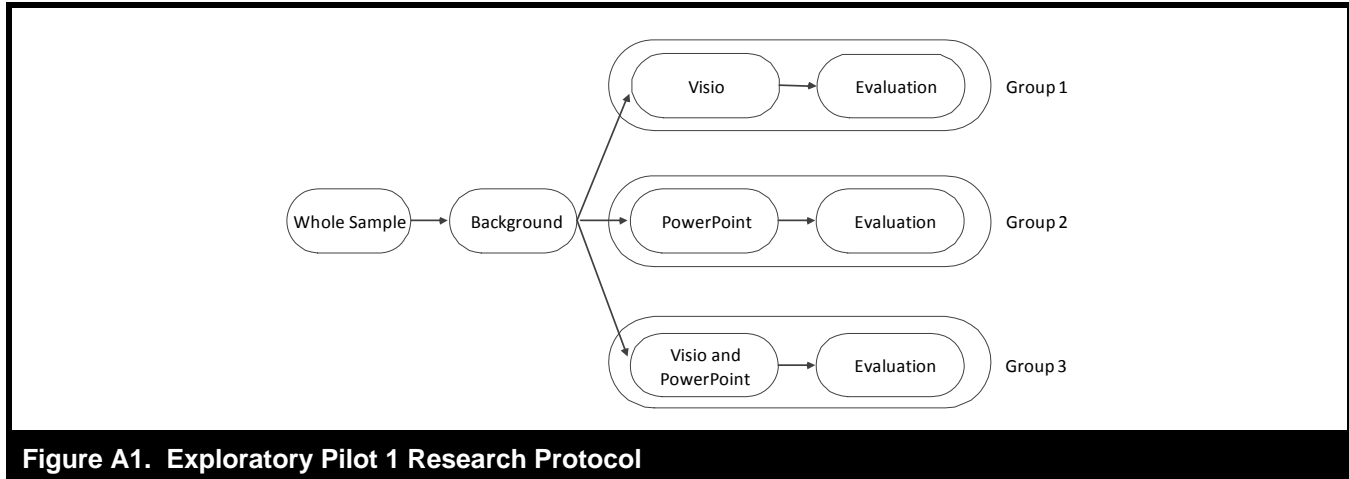
Figure A1. Exploratory Pilot 1 Research Protocol

Analysis and Results

Cronbach's alpha of the technology evaluation measure was 0.91; the evaluation value was calculated by averaging items for each participant. *t*-tests were used to compare the evaluation value between PowerPoint and Visio.[4] First, a paired sample *t*-test was run using the data from Group 3; this analysis found PowerPoint (Mean = 6.01; S.D. = 0.74) to be more highly evaluated than Visio (Mean = 4.73; S.D. = 0.92) (t (78) = 10.37; $p < 0.001$; Cohen's $d = 1.53$; a large effect). Therefore, H1 was supported. Next, an independent sample *t-test* was run using the data from Groups 1 and 2, finding PowerPoint (Mean = 5.59; S.D. = 0.88) and Visio (Mean = 5.31; S.D. = 0.91) to be equivalent (t (139) = 1.87; $p > .05$; Cohen's $d = 0.31$; a medium effect). Thus, H2 was not supported.

Discussion

The first exploratory study partially supports the application of the EH in the context of technology adoption. However, this study used a single category of commercially available technology (software), a vastly different brand awareness level, and a very homogenous participant pool. As such, the second exploratory study was designed to utilize a different technology category (hardware), a more diverse participant pool, and more equivalent assessment of product quality and awareness.

References

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[4]We first examine the effect of potential confounding variables. One-way ANOVA found there were no differences for gender and age across the three treatment groups. Two independent sample *t*-tests found no differences between Groups 1 and Group 3 for "Visio Experience" and between Groups 2 and Group 3 for "PowerPoint Experience."

Appendix B

Exploratory Pilot Study Two: iPad 2 Versus Xoom ▮▮▮▮▮▮▮▮

Experiment Context

The second exploratory study focused on two popular IT products in both the consumer and organizational markets, Apple's iPad 2 and Motorola's Xoom tablet computers (Friedenberg 2010; Kaneshige 2011a, 2011b; Overby 2010; Pitt et al. 2011). At the time of data collection, the iPad 2 and Xoom were receiving comparable ratings in the popular press (e.g., Gideon 2011; Gralla 2011a, 2011b), making the comparison of these technologies appropriate and fair.

For this study we chose to focus on the availability of various *applications* (apps) software and the *customization* features of the tablets. Apps are critical to this technology product and are often a central focus in product reviews (Pitt et al. 2011). Indeed, both Apple and Android devices tout the quality of their app stores. Apps are used to extend the capabilities of the device, allowing users to watch videos, play games, and perform countless other tasks. Thus, the number of apps (at the time of data collection) was provided to participants.[5] Here the availability of apps was a hard-to-evaluate feature.

Customization refers to the ability to tailor the device by changing wallpapers and adding various widgets. Customization is a very relevant feature when individuals evaluate tablets. For example, in a comparison between Xoom and iPad 2, Xoom was favored because it is far more "customizable and feature-rich" (Gralla 2011a). Here, customization is an easy-to-evaluate feature; that is, individuals can easily determine whether they can customize their device or not.

Thus, consider a context where the iPad 2 and Xoom were evaluated primarily on app availability and customization (Table B1). Here the iPad 2 has relatively more apps, but has limited customization. The Xoom can be extensively customized, but has relatively fewer apps. Based on the EH, when evaluating either the iPad 2 or Xoom in isolation, individuals are more likely to perceive the customization feature (i.e., easy-to-evaluate) as being more important, making the evaluation of the Xoom to be higher than iPad2. However, when individuals evaluate both tablets simultaneously, they can directly compare the number of apps available (i.e., hard-to-evaluate). Therefore, the number of apps available (hard-to-evaluate) may be perceived more important. *Thus, the iPad 2 will be viewed higher when jointly compared (H1), while Xoom will be viewed higher when evaluated separately (H2).*

Table B1. Exploratory Pilot 2: iPad 2 Versus Xoom		
	Application Quantity (Hard-to-Evaluate Feature)	**Customization Flexibility (Easy-to-Evaluate Feature)**
iPad 2	Relatively High	Do not Support
Xoom	Relatively Low	Support

Method

An experimental methodology was used to test the hypotheses; the sample, measures and procedures are discussed below.

Sample

The participants for this study came from two sources; about half (52%, n = 65) were from a senior-level business class at the same large public university of Exploratory Pilot Study 1, the rest (48%, n = 60) were recruited using a snowball procedure. Specifically, the student participants were asked to refer their non-student friends or relatives to participate in the study. The average age of student participants was 22.83 (SD 4.84), and 17.14% were female; the average age of "snowball" participants was 31.53 (SD 15.07), and 27.59% were female. About 1% of their final course credit was provided for students' participating and referring an additional participant.

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[5]The study's treatment materials utilized real data at the time of data collection; at that time, the iPad 2 had about 350,000 apps while the Xoom had about 250,000 apps (Shanklin 2011).

Measures

Technology evaluation and technology experience from the first study was changed slightly to fit the new context. A complete list of items is provided in Appendix C.

Task and Experimental Procedure

The task asked participants to imagine that they were buying a tablet for a friend, and to decide whether to buy an iPad 2 or a Xoom. Participants were also asked to primarily focus on the availability of apps and home screen customization features, with everything else (e.g., price) being equal. The procedures and treatment groups followed those of Exploratory Pilot Study 1 (Figure B1).
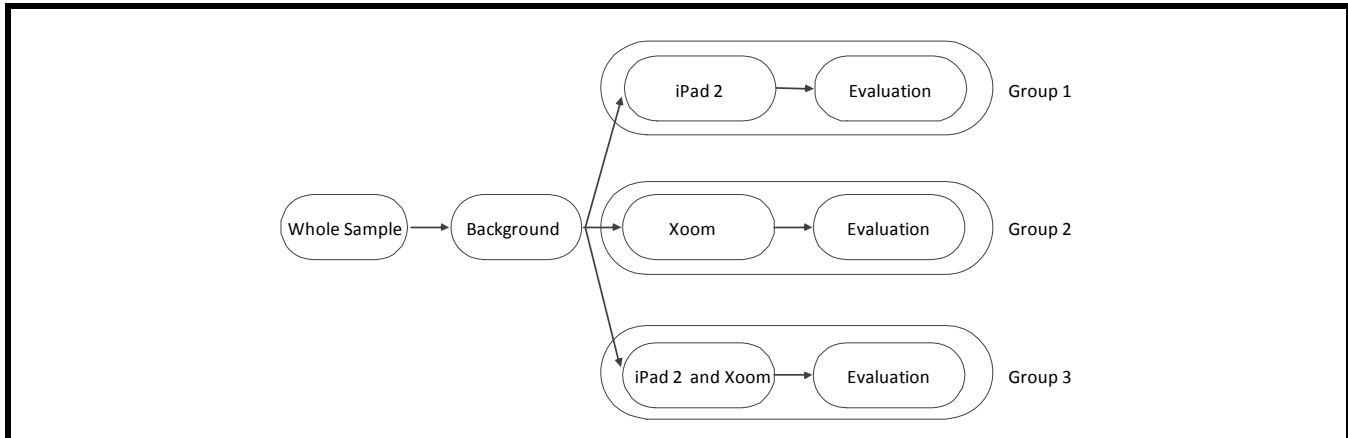

Figure B1. Exploratory Pilot Research Protocol

Analysis and Results

The reliability of the technology evaluation measure was 0.91 (Cronbach's alpha). Two *t*-tests were conducted to compare the evaluation differences between the iPad 2 and Xoom.[6] First, a paired sample *t*-test was run using the data from Group 3; this analysis found the iPad 2 (Mean = 5.51; S.D. = 1.70) to be more highly evaluated than the Xoom (Mean = 4.69; S.D. = 1.39) (t (47) = 2.57; $p < 0.05$; Cohen's d = 0.53; a large effect). Thus, H1 was supported. Next, an independent sample *t*-test was run using the data from Groups 1 and 2; this analysis found the iPad 2 (Mean = 5.27; S.D. = 1.43) and Xoom (Mean = 4.68; S.D. = 1.32) to be equivalent (t (75) = 1.88; $p > .05$; Cohen's d = 0.43; a medium effect). Thus, H2 was not supported.

Discussion

Like the first exploratory pilot study, this study also partially supported the application of the EH. Again, the product with the most favorable hard-to-evaluate feature was preferred when only one technology product was evaluated (supporting H1). However, when compared separately, there were no differences in preferences found between the iPad and Xoom (rejecting H2). Given that both the iPad and PowerPoint had greater brand awareness than the Xoom and Visio (respectively), it is very likely that differences in brand awareness confounded the relative evaluations in both studies. Insights from the two pilot studies informed the design of the primary studies, suggesting that generic, non-branded products should be used to eliminate this likely confound in the product evaluation process.

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[6]There were no significant differences for the technology evaluation measure between student and snowball participants; these samples were therefore pooled. One-way ANOVA found there were no differences for gender and age across the three treatment groups. Two independent sample *t*-tests found no differences between Groups 1 and 3 for "iPad Experience" and between Groups 2 and 3 for "Xoom Experience."

References

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Appendix C

Instrument[7] ▮▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▮

Note: Each item was measured using a seven-point Likert-type scale (1 = strongly disagree, 7 = strongly agree).

All Studies

Technology Experience

TE   I am very familiar with MS PowerPoint/MS Visio (or iPad 2/Xoom, or wireless Internet) before this study.

Exploratory Pilot Study One

Technology Evaluation

Eva1   This technology is a good tool overall.

Eva2   I think it would be very good to use the technology.

Eva3   In my opinion it would be very desirable to use the technology.

Eva4   The technology can increase my effectiveness while completing the tasks.

Eva5   It would be much better for me to use the technology.

Exploratory Pilot Study Two

Technology Evaluation

Eva1   iPad 2/Xoom is good overall.

Eva2   In my opinion it would be very desirable to have an iPad 2/Xoom.

Eva3   I think it would be very good to have an iPad 2/Xoom.

Experiment 1 and 2

Technology Evaluation

Eva1   Plan A/Plan B is good overall.

Eva2   In my opinion it would be very desirable to implement Plan A/Plan B.

Eva3   I think it would be very good to implement Plan A/ Plan B.

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[7]Items and tasks for the main studies were first written in English and were then translated into Chinese using two bilingual Chinese research assistants (RA). The first RA translated items and tasks into Chinese; the second RA translated items and tasks back into English. Any differences or inconsistencies were discussed and resolved.

Appendix D

Experimental Task Descriptions ▮▮▮▮▮▮▮▮▮▮▮

Exploratory Pilot Study 1

JE Condition

Imagine that the instructor from one of your classes asked you to draw a chart for a company, which contains a CEO (Chief Executive Officer), a CFO (Chief Financial Officer), a CIO (Chief Information Officer), a CMO (Chief Marketing Officer) and a COO (Chief Operating Officer). Four other officers report to CEO directly. Figure D1 shows an example.
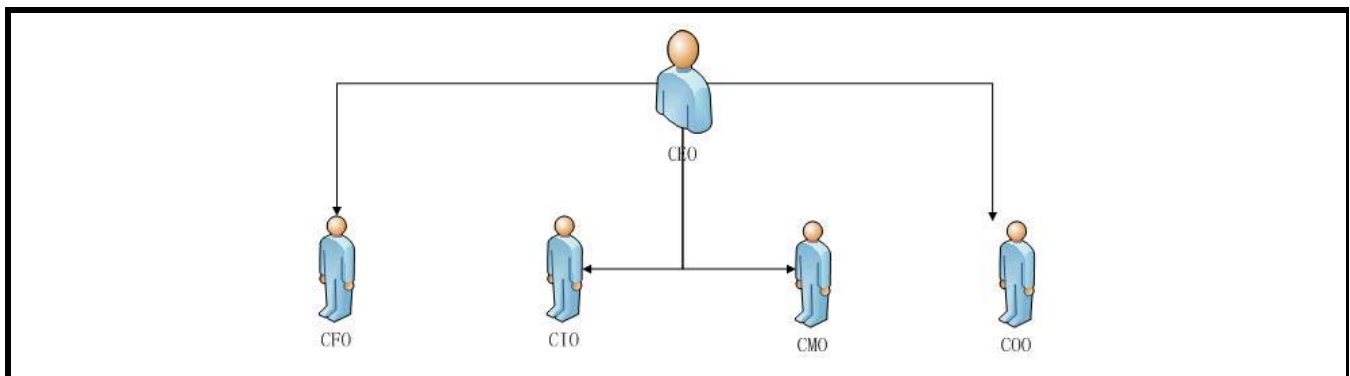

Figure D1. An Example of the Chart

There are two types of software available from the desktop in the lab which can help finish the assignment. One of the software is MS PowerPoint, and the other is MS Visio.

MS PowerPoint: Following are some comments from previous users of MS PowerPoint:

> This software is not quite flexible if my needs change. When the requirements change it is hard (even impossible) to change the selection and format available. On the other hand, it is quite easy to find out what function is available and locate it, even if I have not used that function before. Quite often I will find it in no time.

MS Visio: Following are some comments from previous users of Visio:

> This software is very flexible to respond to my changing needs. When the requirements change it is easy to change the selection and format available. On the other hand, it is not quite easy to locate a function on a particular issue, especially when I have not used that function before. Sometimes it takes me too much time to find the function I need.

SE Condition 1

Imagine that the instructor from one of your classes asked you to draw a chart for a company, which contains a CEO (Chief Executive Officer), a CFO (Chief Financial Officer), a CIO (Chief Information Officer), a CMO (Chief Marketing Officer),and a COO (Chief Operating Officer). Four other officers report to CEO directly. Figure D1 provides an example.

The software available from the desktop in the lab which can help finish the assignment is MS Visio.
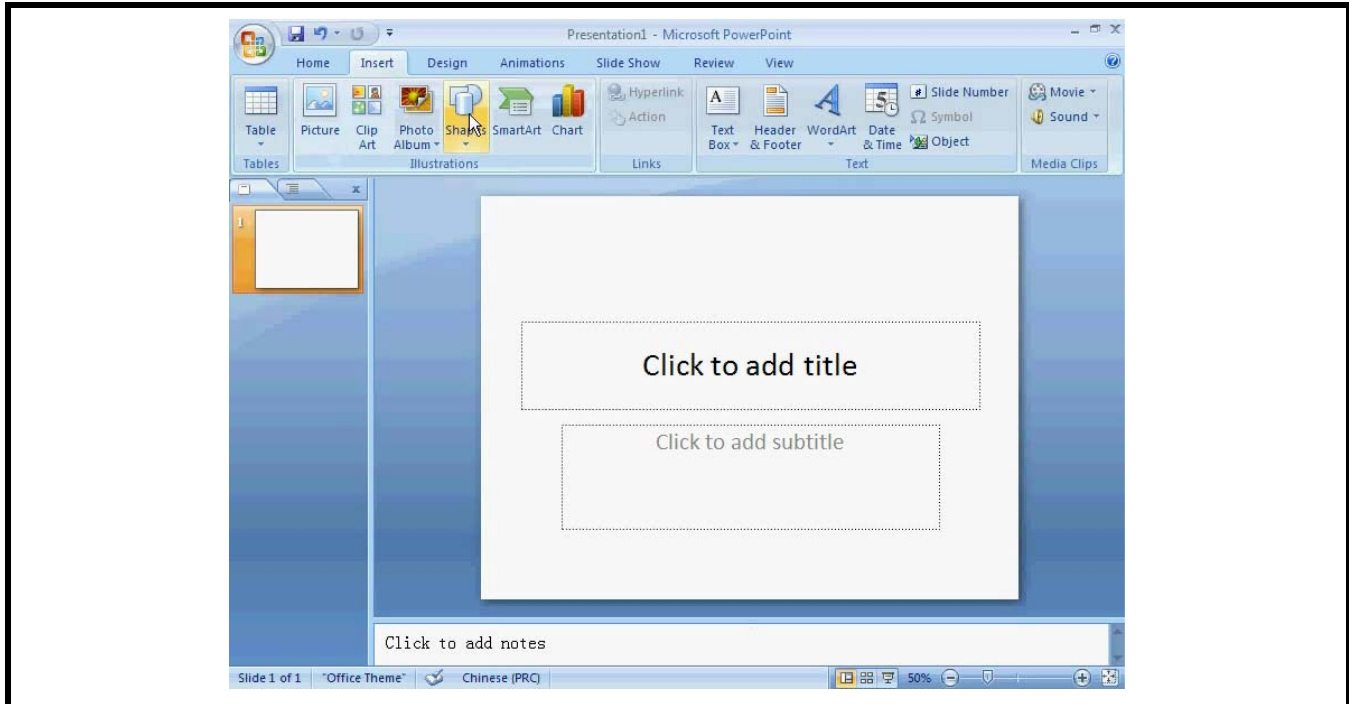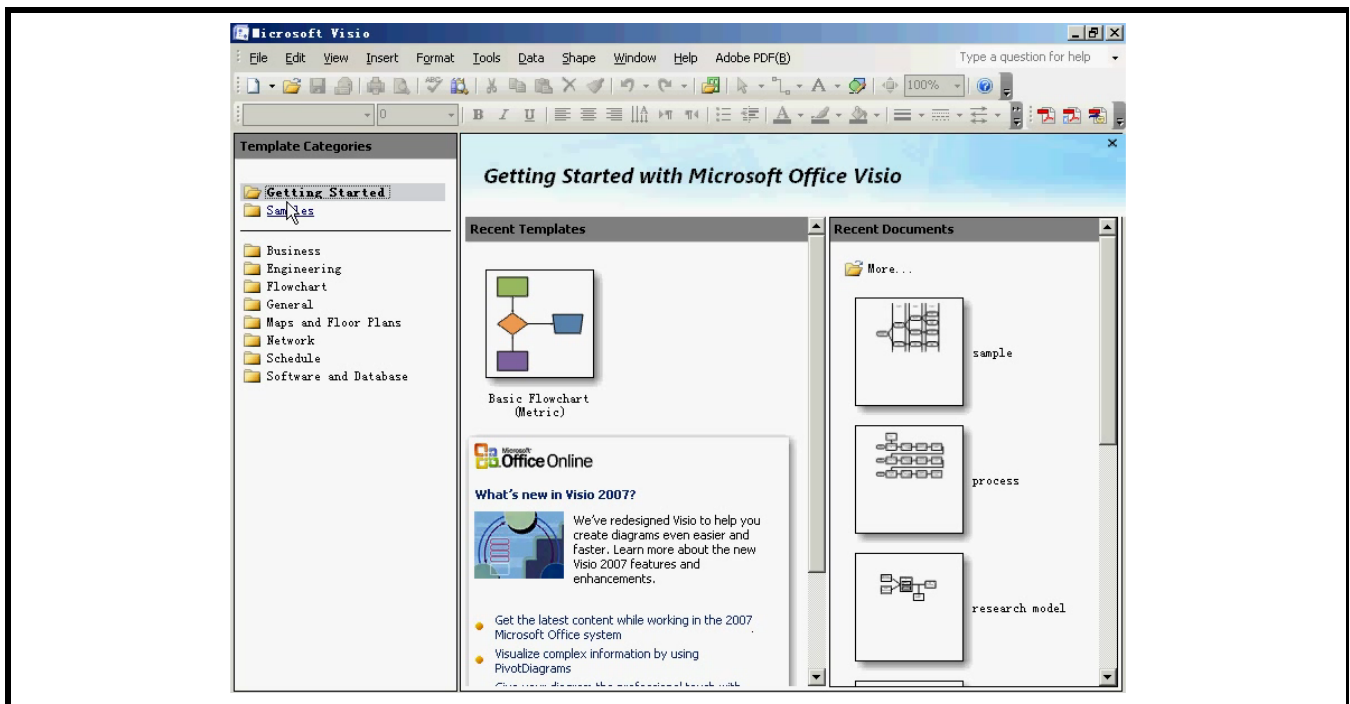
Figure D2. Video Tutorial of PowerPoint

Figure D3 Video Tutorial of Visio

MS Visio: Following are some comments from previous users of Visio:

> This software is very flexible to respond to my changing needs. When the requirements change it is easy to change the selection and format available. On the other hand, it is not quite easy to locate a function on a particular issue, especially when I have not used that function before. Sometimes it takes me too much time to find the function I need.

SE Condition 2

Imagine that the instructor from one of your classes asked you to draw a chart for a company, which contains a CEO (Chief Executive Officer), a CFO (Chief Financial Officer), a CIO (Chief Information Officer), a CMO (Chief Marketing Officer), and a COO (Chief Operating Officer). Four other officers report to CEO directly. Figure D1 provides an example.

The software available from the desktop in the lab which can help finish the assignment is MS PowerPoint.

MS PowerPoint: Following are some comments from previous users of MS PowerPoint:

> This software is not quite flexible if my needs change. When the requirements change it is hard (even impossible) to change the selection and format available. On the other hand, it is quite easy to find out what function is available and locate it, even if I have not used that function before. Quite often I will find it in no time.

Exploratory Pilot Study 2

JE Condition

Imagine that you are going to buy a gift for one of your friends. You are trying to decide whether to buy an iPad 2 or a Xoom.

Assume that you care most about the number of applications available and the customization feature. Here are the short descriptions for these two features from iPad 2 and Xoom (assume that everything else, such as price and other features, is the same).

Table D1. iPad 2 Versus Xoom		
	iPad 2	**Xoom**
Applications	iPad 2 has about 350,000 apps available from the Apple App Store.	Xoom currently has about 250,000 apps from the Android market.
Customization	iPad cannot do customization unless you jailbreak it.	You have to open customization from themes, widgets to customized home screen and live wallpapers.

SE Condition 1

Imagine that you are going to buy a gift for one of your friends. You are trying to decide whether to buy an iPad 2.

Assume that you care most about the number of applications available and the customization feature. Here are the short descriptions for these two features from iPad 2 (refer to the second column of Table D1).

SE Condition 2

Imagine that you are going to buy a gift for one of your friends. You are trying to decide whether to buy a Xoom.

Assume that you care most about the number of applications available and the customization feature. Here are the short descriptions for these two features from Xoom (refer to the third column of Table D1).

Experiment 1

JE Condition

Your school is thinking of implementing wireless Internet connection throughout the entire campus. As a student, you are interested in the speed of the Internet connection and whether the data you transfer when browsing the web or downloading files is secure. Currently, there are two plans being considered that differ on download speed and security. All other features, such as the cost to implement, ease of access, and so on are the same.

Plan A: In the first plan, the connection speed is 110 mbps; on the other hand, the connection is not secure, making it possible for others to be able to view the files that you download or the websites you visit.

Plan B: In the second plan, the connection speed is 15 mbps; on the other hand, the connection is secure, making it very difficult for others to be able to view the files that you download or the websites that you visit.

SE Condition 1

Your school is thinking of implementing wireless Internet connection throughout the entire campus. As a student, you are interested in the speed of the Internet connection and whether the data you transfer when browsing the web or downloading files is secure. Currently, there is one plan being considered.

Plan: In this plan, the connection speed is 110 mbps; on the other hand, the connection is not secure, making it possible for others to be able to view the files that you download or the websites you visit.

SE Condition 2

Your school is thinking of implementing wireless Internet connection throughout the entire campus. As a student, you are interested in the speed of the Internet connection and whether the data you transfer when browsing the web or downloading files is secure. Currently, there is one plan being considered.

Plan: In this plan, the connection speed is 15 mbps; on the other hand, the connection is secure, making it very difficult for others to be able to view the files that you download or the websites that you visit.

Experiment 2

JE Condition

Your school is thinking of implementing wireless Internet connection throughout the entire campus. As a student, you are interested in the speed of the Internet connection and whether the data you transfer when browsing the web or downloading files is secure. Currently, there are two plans being considered that differ on download speed and security. All other features, such as speed, stability, ease of access, and so on are the same. Now you are browsing the planning document and find the following statement:

Plan A: In the first plan, the connection speed is 110, and the security level is 2.

Plan B: In the second plan, the connection speed is 15 and the security level is 5.

Here the higher number of speed represents faster speed; the higher number of security represents a more secured network.

Now you have told the system analyst that the document does not contain enough information, and the system analyst has updated the document. Here is the updated content in the new document:

Plan A: In the first plan, the connection speed is 110, and the security level is 2.

Plan B: In the second plan, the connection speed is 15 and the security level is 5.

Here the higher number of speed represents faster speed; the higher number of security represents a more secured network, and the number here represents the rank of security. Specifically, in rank 2, the network will use a static key to encrypt the communication. Therefore, while the static key can protect the network, hackers may obtain the key after it is used for a while. In rank 5, the network will use continually changing keys to encrypt the data. Therefore, it is relatively difficult for hackers to obtain the key.

SE Condition 1

Your school is thinking of implementing wireless Internet connection throughout the entire campus. As a student, you are interested in the speed of the Internet connection and whether the data you transfer when browsing the web or downloading files is secure. Currently, there is one plan being considered. Now you are browsing the planning document and find the following statement:

Plan: In this plan, the connection speed is 110, and the security level is 2.

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Plan: In this plan, the connection speed is 110, and the security level is 2.

Here the higher number of speed represents faster speed; the higher number of security represents a more secured network, and the number here represents the rank of security. Specifically, in rank 2, the network will use a static key to encrypt the communication. Therefore, while the static key can protect the network, hackers may obtain the key after it is used for a while.

SE Condition 2

Your school is thinking of implementing wireless Internet connection throughout the entire campus. As a student, you are interested in the speed of the Internet connection and whether the data you transfer when browsing the web or downloading files is secure. Currently, there is one plan being considered. Now you are browsing the planning document and find the following statement:

Plan: In this plan, the connection speed is 15 and the security level is 5.

Here the higher number of speed represents faster speed; the higher number of security represents a more secured network.

Now you have told the system analyst that the document does not contain enough information, and the system analyst has updated the document. Here is the updated content in the new document:

Plan: In this plan, the connection speed is 15 and the security level is 5.

Here the higher number of speed represents faster speed; the higher number of security represents a more secured network, and the number here represents the rank of security. Specifically, in rank 5, the network will use continually changing keys to encrypt the data. Therefore, it is relatively difficult for hackers to obtain the key.