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Hahn, Andrew, J. Analyzing Planning Factors for the Training of a Web Design Team

Abstract

The strengths, weaknesses, opportunities, and threats (SWOT) analysis has become a widely adopted strategic planning tool since its inception in the 1960s. Virtually every industry can benefit from using SWOT analysis from manufacturing, education, and marketing. SWOT analysis has its advantages and disadvantages, but examining these and using it appropriately can have a positive effect on strategic planning. This study uses the SWOT analysis combined with the Analytical Hierarchy Process (AHP) to gather planning data on a web design team at an undisclosed company, hereafter referred to as Company X. The data gathered from this study will be used as a basis for the planning of training and for further research on training at Company X.

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Chapter I: Introduction

The analyzing and planning for a training program is a step which cannot be overlooked. Knowing the specific goal that the training will potentially achieve and the obstacles the training will encounter is critical to the success of the training program. The strength, weakness, opportunity, threat (SWOT) analysis is one of many planning and scoping tools which can be used for this planning. When used in conjunction with the analytic hierarchy process (AHP), SWOT factors can be ranked and be given quantitative data. Given that businesses have limited time and money, having quantitative available makes decision making more scrupulous and analytical.

The company which this study has been conducted at has requested anonymity. For reference, the company shall heron in be referred to as Company X. For clarification purpose, the company's primary industry is Internet advertising websites.

Statement of the Problem

Company X is an Internet website advertising company. They produce websites which attract an audience in a given market and from those websites they create leads for their clients. Within Company X is the customer operations group that fulfills the clients order once they purchase a product. Within the customer operations group, the primary target of this study is the web design team. This team creates the graphic design of the website. Their role is to create an illustration of the website which the client approves of and is then sent to the development team. The development team then takes the illustration and turns it into a functional website on the Internet.

An agreement has been determined by the manager of the design and development team that the design team needs training on development. The problem is that the scope of the training is undetermined and it will take an undetermined amount of time & money from Company X.

Purpose of the Study

The purpose of this study is to discover factors for the feasibility and scope of this training. Company X will want to know of time & money needed for the training and of the training's benefits. This also applies to the design and development managers.

Assumptions of the Study

It is assumed that training needs to be applied to the design team. Additionally, it is assumed that the business needs to be made aware of the training needs so Company X can make the appropriate decision with this study's data.

Definitions of Terms

AM. Account Manager, this employee assist client during the duration of their relationship with Company X.

CDC. Customer Development Consultant, this is a field sales person.

CSS. Cascading Style Sheet, this is the file is used to style HTML on websites. The World Wide Web Consortium (n.d.) describes it as, "the language for describing the presentation of Web pages, including colors, layout, and fonts."

CSS3. This is the latest version of CSS on the Internet.

FED. Front End Development, this is the client facing portion of the website that users see and interact with using their Internet device.

Flash. A programming language licensed by Adobe to add enhanced graphical elements to a website. Adobe (n.d.) describes Flash as, "Adobe Flash Player is the standard for delivering high-impact, rich Web content. Designs, animation, and application user interfaces are deployed immediately across all browsers and platforms, attracting and engaging users with a rich Web experience."

HTML. Hypertext Markup Language, this is the structural code of a website. The World Wide Web Consortium (n.d.) describes it as, "the language for describing the structure of Web pages."

HTML5. Hypertext Markup Language version 5, this is the latest version of HTML on the Internet.

JavaScript. A programming language used on websites to add additional functionality. MDN (n.d.) describes it as, "is a lightweight, object-oriented language, most known as the scripting language for web pages, but used in many non-browser environments as well."

jQuery. A JavaScript library used to add additional functionality to websites. JQuery: The Write Less, Do More, JavaScript Library (n.d.) describes it as, "JQuery is a fast and concise JavaScript Library that simplifies HTML document traversing, event handling, animating, and Ajax interactions for rapid web development."

Maintenance development. Web development which occurs to existing websites at Company X.

Slice(d). A method of extracting images from Photoshop.

Photoshop. A graphic design program created by Adobe used to create and edit files used in the creation of design files.

PM. Project Manager, this employee guides the client through the building process of their website product.

Progressive Enhancement. A method of serving web browsers different front end development versions depending on the web browser's capabilities.

Responsive Design. A method of serving web browsers different cascading style sheets depending the screen size.

SEO. Search Engine Optimization, a process of making websites rank better on a search engine.

Site Speed. The time that it takes for a website to load on a user's Internet machine.

Limitations of the Study

The study relies on self-reported skill levels from the design team, thus we are limited by knowing the true level of skill which could have been determined through testing. Due to time limitations, testing was not a feasible option. The determination of SWOT factors being positive or negative is limited since they are assumptions by the design and development managers. However, the managers are the most credible source to be making these assumptions.

Methodology

The study is conducted in three phases. First, a web survey is sent to the design team to gauge their web development skill level and determine what the team may be interested on for training. Second, an online collaborative SWOT document is sent to design and web team managers, team leads and seniors. Last, the design and development managers met to do pairwise comparisons of the factors identified in the SWOT analysis.

Chapter II: Literature Review

SWOT Analysis Overview

    History.

    SWOT is an acronym for strengths, weaknesses, opportunities, and threats and it is a tool used in strategic planning (Chermack & Kasshanna, 2007). Kaufman, Oakley-Browne, Watkins, and Leigh (2003) also call SWOT, "A performance audit on methods and means and their effectiveness" (p. 259). According to Fullmer (2009) Alfred Sloan, chief executive of General Motors from 1923 to 1946 began to analyze General Motors on its strengths and weaknesses. In 1957 Andrews stated how organizations need clear objectives to stay competitive. Also in the 1950s it was being studied how organizations related to their external factors (Chermack & Kasshanna, 2007). These ideas became the foundation for the Harvard Business School to analyze case studies in 1960s. Next, in 1963 at a business policy conference held at the Harvard Business School, SWOT analysis was discussed and decided to be an important strategic planning tool. The Stanford Research Institute provided further understanding into SWOT analysis from 1960 to 1970 concerning failures in organizations. A 250 item questionnaire was sent to CEOs from 1,100 different companies inquiring, "How to strengthen planning practices in the future and avoid what were being viewed as planning failures" (Chermack & Kasshanna, 2007, p. 387). The results of this study lead to the SOFT analysis, which stands for satisfactory (good in the present), opportunity (good in the future), fault (bad in the present), and threat (bad in the present). Urick and Orr later changed satisfactory to strength and fault to weakness, creating the SWOT which is known today. The Volkswagen company furthered SWOT analysis development when it completed a strategic exercise in the 1970s (Dyson, 2002). Concerned about labor costs and exporting to the United States, Volkswagen created the TOWS matrix to

provide understanding into their threats, opportunities, weaknesses, and strengths.

Applications.

The SWOT analysis is a widely used method of strategic planning. According to DeSilets (2008) SWOT analysis is reported to be the most commonly used technique for management decision making. Simoneaux and Stroud (2011) mention that a SWOT analysis should be done with the creation of a business plan. Additionally, they mention performing an annual SWOT to update the business plan, "The SWOT analysis allows a company to assess where it is today and where it wants to go, which are integral components of a living, breathing business plan" (p. 75). Business processes can also use SWOT, as Illustrated in *Six Sigma: Advanced Tools for Black Belts and Master Back Belts*. Here, Tang, Goh, Yam, and Yoap (2006) us SWOT to analyze the Six Sigma process. Three to eight factors are identified for strengths, weakness, opportunities and threats accompanied by supporting text. The synthesis of these results informs the reader of Six Sigma's position in the quality improvement realm and where to look for shortcomings.

As outlined in *SWOT Analysis: It's Time for a Product Recall*, Hill and Westbrook use SWOT within manufacturing planning and implementation. Hill and Westbrook mention that SWOT is used in the food, textiles, clothing, pottery, and engineering fields. Additionally, Tribe (1997) uses a SWOT analysis within the tourism industry. Specifically, the SWOT is focused on the Changi Airport in Singapore. The study focuses on seven ideas: resource audit, performance monitoring, product evaluation, competitive environment, political environment, economic environment, socio-cultural environment, and technological environment. In another example of strategic planning, Reddy (1994) implements a SWOT analysis to compare companies in the United States against foreign companies in regards to market share. A SWOT analysis is done

for each the groups at a high level and compared against each other. The result is a discussion on how U.S. companies can exploit their strengths domestically and how to defend their market share against foreign companies.

The information technology and public realms can also use SWOT analysis in strategic planning. In *The Strengths, Weaknesses, Opportunities and Threats of Using Social Software in Higher and Further Education Teaching and Learning*, Schroeder, Minocha, and Schneider (2010) perform a SWOT analysis on data gathered from twenty case studies involving social software initiatives. The synthesis of the case studies found up to ten items for each strengths, weaknesses, opportunities, and threats. Further explanation of each point found provided an explanation for their inclusion. The findings were then summarized for use in educational practice.

SWOT Analysis Implementation.

SWOT analyses can be presented in many different ways (Chermack & Kasshanna, 2007) and data gathering methods can vary as well (Kaufman et al., 2003). Appendix A compares four methods for implementing a SWOT analysis. The premise of this model is a SWOT analysis for a business plan. The authors mention that prior to these steps a review of the vision statement or mission should be done (p. 75). This can be considered the goal of the SWOT analysis, which Kaufman et al. (2007) and Kasshanna (2007) have included as the first step of conducting a SWOT analysis.

Data Collecting.

Qualitative data.

SWOT analysis data can be gained from a variety of different methods. Data gathering

methods can include stakeholder analysis, issue analysis, competitor analysis, environmental scanning, and scenario scanning (Kaufman et al., 2003). Chermack and Kasshanna (2007) state that, "SWOT is a dynamic process for decision-making and is actually a form of brainstorming in that it looks at future possibilities for the organization through a systematic approach into both positives and negative concerns" (as cited in Balamuralikrishna and Dugger, 1995). Here the data is being gathered in brainstorming, specifically through a group meeting and facilitated by a group leader. A list of strengths, weaknesses, opportunities, and threats are identified and agreed upon by the group as the primary issues facing the group and its intended goal. Hill and Westbrook (1997) identify three data gathering methods which are all similar in that they are brainstorming techniques:

1) An individual client company's senior manager undertakes the analysis alone, or a consultant does it himself after discussion with senior managers.

2) Several senior managers of a company would undertake individual SWOTs, which are then collated. This collation may or may not then be followed by a meeting in which a communal SWOT is agreed.

3) The SWOT is the output from a meeting or meetings of managers, who all contribute to the final analysis. The meeting may be facilitated by the consultant or a client company employee (p. 48).

Jarratt and Stiles (2010) also reference brainstorming as, "Another rationale for using SWOT, BCG and portfolio tools involved forming a frame of reference for brainstorming" (p. 35).

Quantitative Data.

Brainstorming is perhaps the fundamental data collection technique used in SWOT

analysis, and additional techniques have improved upon this qualitative method by attempting to quantify the gathered data. In Dyson's SWOT analysis (2002) the analysis began with idea generating. After this session was completed, a follow up questionnaire was sent out. "In the follow up questionnaire participants were asked to score each item on the scale of 1–5 where for example 5 represented an opportunity not to be missed" (p. 634). Next, the same group which participated in the brainstorming thought of strategies to approach the highest rated strengths, weaknesses, opportunities, threats. The same scale was then used to rank the suggested strategies and provide a basis for strategic planning.

Analytical Hierarchy Process

A more rigorous approach for quantifying SWOT data comes when the analytical hierarchy process (AHP) is applied. Saaty (1994) briefly explains the process as this, "In the AHP, a problem is structured as a hierarchy. This is then followed by a process of prioritization…" (p. 22). The prioritization of elements is determined by a judgment of dominance of one element over another. The first step in conducting the AHP is to create a hierarchy of the goal or mission. Next, subgoals are identified along with subcriteria that are needed to satisfy the parent subgoal. Once a hierarchy is created, comparisons are carried out. "A judgment or comparison is the numerical representation of a relationship between two elements that share a common parent…" (Saaty, 1994, p.25). The judgment determines which criterion is dominate and how strongly it is dominate on a scale of one through nine. Criteria are ranked relative to their parent criteria or subgoal. Saaty (1994) says this in regard to people being able to make comparisons:

Cognitive psychologists have recognized for some time that people are able to make two kinds of comparisons—absolute and relative. In absolute comparisons, people compare

alternatives with a standard in their memory that they have developed through experience. In relative comparisons, they compared alternatives in pairs according to a common attribute… (p. 33).

In the AHP, the common attribute is the parent criterion or subgoal, so relative comparisons are made. Saaty (1994) also mentions that we must consider how people make decisions naturally and assist in organizing their thinking to improve natural decision making. In summary, AHP builds upon the innate human ability to make sound judgments about small problems (p. 21).

Applying the AHP method to SWOT analysis allows qualitative data derived from SWOT to become quantitative. Arslan and Turan (2009) provide us with reason why combining SWOT with the analytical hierarchy process is of value:

As strategy planning procedures are complicated by numerous criteria and interdependencies, the utilization of conventional SWOT analysis has become insufficient because of its qualitativity [sic]. By utilizing the AHP in SWOT analysis, individual SWOT factors can be weighted and rated quantitatively. (p. 133).

Kajanus, Kangas, and Kurttila (2004) confirm this combination of techniques saying that, "SWOT analysis is made more analytical by giving numerical rates to the SWOT factors as well as to the four SWOT groups" (para. 7). However, in Kajanus, Kangas, and Kurttila (2004) study on rural tourism, the authors applied the Simple Multi-Attribute Rating Technique (SMART). According the authors, SMART is easier to use in situations where a large number of criteria or alternatives are present and in situations where pair-wise comparisons are difficult to make. In carrying out the study, the authors used the following technique:

1. SWOT analysis is carried out. The relevant factors of the external and internal environment are identified and included in the SWOT analysis.

2. The mutual importance of the SWOT factors is determined separately within each

   SWOT group. When the SMART method and its simple rating version are applied,

   the importance of the SWOT factors is defined as follows: 100 points are allocated

   for SWOT factors according their importance separately in each SWOT group.

3. The mutual importance of the SWOT groups is determined. One hundred points are

   allocated to the four SWOT groups. Finally the individual SWOT factors within each

   SWOT group are scaled according to these priority values. (para. 10).

Shinno, Yoshioka, Marpaung, and Hachiga (2006) also performed a hybrid SWOT and AHP

study in *Quantitative SWOT Analysis on Global Competitiveness of Machine Tool Industry*.

However, the approach did not use strengths, weaknesses, opportunities, and threats as subgoals

for the study. Instead the study conducted a SWOT analysis to discover data points and then

grouped the points into market-related, organization-related, and product-related subgroups.

From here, the AHP was carried out to determine the study's results.

Fuzzy Set Theory

Finally, Ghazinoory, Zadeh, and Memariani (2007) propose using fuzzy set theory in

conjunction with SWOT. Fuzzy set theory is a mathematical theory of how objects belong to

groups. Specifically, the founder of fuzzy set theory L.A. Zadeh (1965) explains it as this,

A fuzzy set is a class of objects with a continuum of grades of membership. Such a set is

characterized by a membership (characteristic) function which assigns to each object a

grade or membership ranging between zero and one (p. 338).

In Ghazinoory et al. (2007) the study integrates SWOT with fuzzy set theory by first conducting

a SWOT analysis and then creating groups of internal (strengths/weaknesses) and external

(opportunities/threats) factors. Factors gathered from the SWOT analysis are then ranked on a

scale of negative ten to ten, with strengths and opportunities ranking within the zero to ten range

and threats and opportunities ranking from zero to negative ten. Additionally, each SWOT factor

is assigned more than one ranking, which introduces the fuzzy set theory aspect of the study.

Each SWOT factor is ranked against the question, "What are the pessimistic, probable, and

opportunistic values for this factor?" Data aggregated from these data points are then plotted on

a graph and strategies are developed from factors that are nearest the exterior corners of the

graph.

Advantages and Disadvantages of SWOT Analysis.

The SWOT analysis has been in existence for over fifty years and has become a popular,

enduring, and common planning activity (Desilets, 2008; Hill & Westbrook, 1997). Perhaps the

main advantage of the SWOT analysis is its simplicity. As cited in Barney (1995), it is a simple

framework which points to the importance of internal and external factors. Shinno et al. (2006)

also reference SWOT analysis as an effective means for analyzing internal and external

environments. SWOT is also called rich and prompt by Chermack and Kasshanna (2007). The

same authors also mention, "When used properly, SWOT analysis can help find the best match

between environmental trends (opportunities and threats) and internal capabilities" (p. 388).

SWOT analysis helps planners with gaining shared overview of the task at hand and identifies

barriers to strategic objectives (Kaufman et al., 2007, p. 262). Simoneaux and Stroud (2011) also

say, "The SWOT analysis is an effective tool for managing change, determining strategic

direction, and setting realistic goals and objectives" (p. 75). While the simplicity of SWOT can

be called one of its advantages, simplicity can also be considered one of SWOT analysis's

disadvantages.

Hill and Westbrook (1997) provide a comprehensive overview of SWOT's disadvantages

in "SWOT Analysis: It's Time for a Product Recall." In the review of twenty SWOT analyses

carried out at United Kingdom manufacturing companies in 1993-1994, the authors had many

concerns:

- The terms used to describe factors were general and often vague, e.g. 'value for money',

  'performance' and so on.

- No analysis or verification of any point was undertaken.

- All points were universal, i.e. assumed to apply equally to all products, functions and

  markets.

- After the lists were produced, the consultants made their own list, which differed

  significantly from those of company personnel. But there had been no onsite work by the

  consultant in the interim and no explanation of the differences between the lists was

  offered (p. 48).

The authors realize that textbooks say list making is not where SWOT data mining should end.

Relative importance should be assigned to items in the SWOT list to help in prioritization.

However, all but one of the twenty cases did not prioritize their SWOT lists. These cases also

had a wide ranging number of items in their lists. The minimum list amount contained 11 items

and the maximum list had over 100 items. As noted in "SWOT is Useful in Your Toolkit" by

DeSilets (2003), five is the recommend items per group since it is difficult to address more items

then that at a time. Kaufman et al. (2007) also states that SWOT analysis can generate too much

data, or not enough data.

In Hill and Westbrook's (1997) synthesis, SWOT analysis was seen only as a way of making

lists and not true strategic analysis. Their summary of findings is as follows:

- The length of the lists.

- No requirement to prioritize or weight the factors identified.

- Unclear and ambiguous words and phrases.

- No resolution of conflicts (as with the example given in the preceding paragraph).

- No obligation to verify statements and opinions with data or analyses.

- Single level of analysis is all that is required.

- No logical link with an implementation phase. (p. 51).

Coman and Ronen (2009) reflect this same set of disadvantages:

- No straightforward methodology has been proposed to identify strengths and weaknesses.

- Most SWOT analyses focus on an excessive number of the organisation's [sic] strengths and weaknesses rather than on the main ones, which makes it difficult to translate the findings into actions.

- There is no indication of causality among the strengths and weaknesses, nor are they ranked into any hierarchy.

- The SWOT analysis is typically a one-time event lacking mechanisms for acting upon and monitoring the changes in strengths and weaknesses over the longer term.

To counter these disadvantages, the authors recommend that SWOT lists are concise, actionable, significant, and authentic.

Chapter III: Methodology

Goal of the Study

I conducted a SWOT analysis on a web design team and its assumed need for training on the subject of web development skills. The Analytic Hierarchy Process is used to weigh the results of the SWOT analysis and provide quantitative value to the SWOT results. The results of the study provides information on why training may need to occur and what factors to consider in the creation of training.

Subject Selection and Description

The design team which is studied is of production nature. The primary production is advertising websites and secondary production varies from nonprofit websites and internal company websites. Website production is grouped into different levels based on the product specification. Currently there are four products being developed: levels one through four. Each level of website increases in technical difficulty as the product level increases.

Other production goals include Flash and jQuery and website refresh. Flash and jQuery are additional products the client can purchase for their website which make them graphically enhanced and add additional functionality to their website. Website refresh is a service where the website's design and/or content can be completely reviewed and redone. Essentially, it is website maintenance and product integration but done by another team at Company X.

Instrumentation and Data Collection

Skill Survey.

Currently, there are approximately 40 employees involved with the design of websites at Company X. Arranging a meeting for these employees would prove nearly impossible due to

standing meetings, production goals, and due to the fact that many telecommute part time. Because of these facts, an emailed survey was best suited to gather information from the complete team. Participants which were emailed the skill survey will include:

- Designers
- Design Seniors
- Design Team Leads
- Manager of Design
- Refresh Designers
- Refresh Senior Designers

See appendix B for the survey which was sent to the design team. The five question skill survey was used to gauge the current level of web development skills of the design team. The first three questions ranked the knowledge of the designer, and the last two questions gained information on what the team would want to learn.

SWOT Analysis.

For the SWOT analysis the following were chosen to be included:

- Design Seniors
- Design Team Leads
- Manager of Design
- Development Seniors
- Development Team Leads
- Manager of Development

Analytic Hierarchy Process.

The Taleai, Mansourian, and Sharifi (2009) SWOT-AHP model will be followed for developing the hierarchy. The example of this can be found in "Surveying general prospects and challenges of GIS implementation in developing countries: a SWOT–AHP approach" (p. 300). This model's first hierarchy level consists of creating criteria which describes groups of general data. The SWOT criterions where then grouped in the appropriate hierarchy level as needed. Figure 1 models the hierarchy which the aggregated SWOT data used.
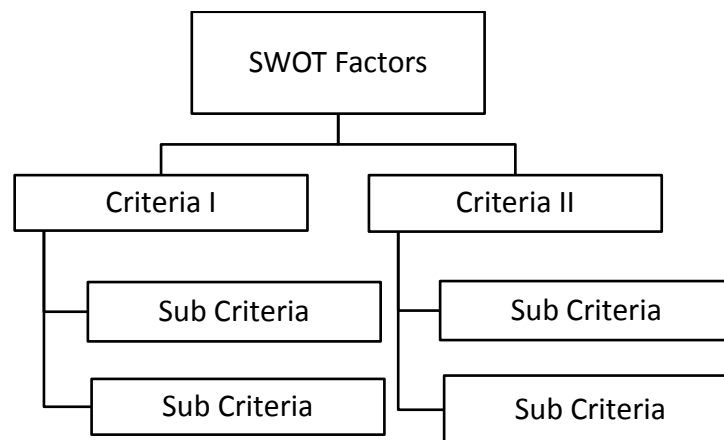
Figure 1. Classifications of SWOT factors within the AHP model.

The design and development managers completed the pairwise comparisons because their position allows for the most authority on the SWOT factors and how they apply to the company. Prior to the meeting, the SWOT criteria were arranged into the following hierarchy.
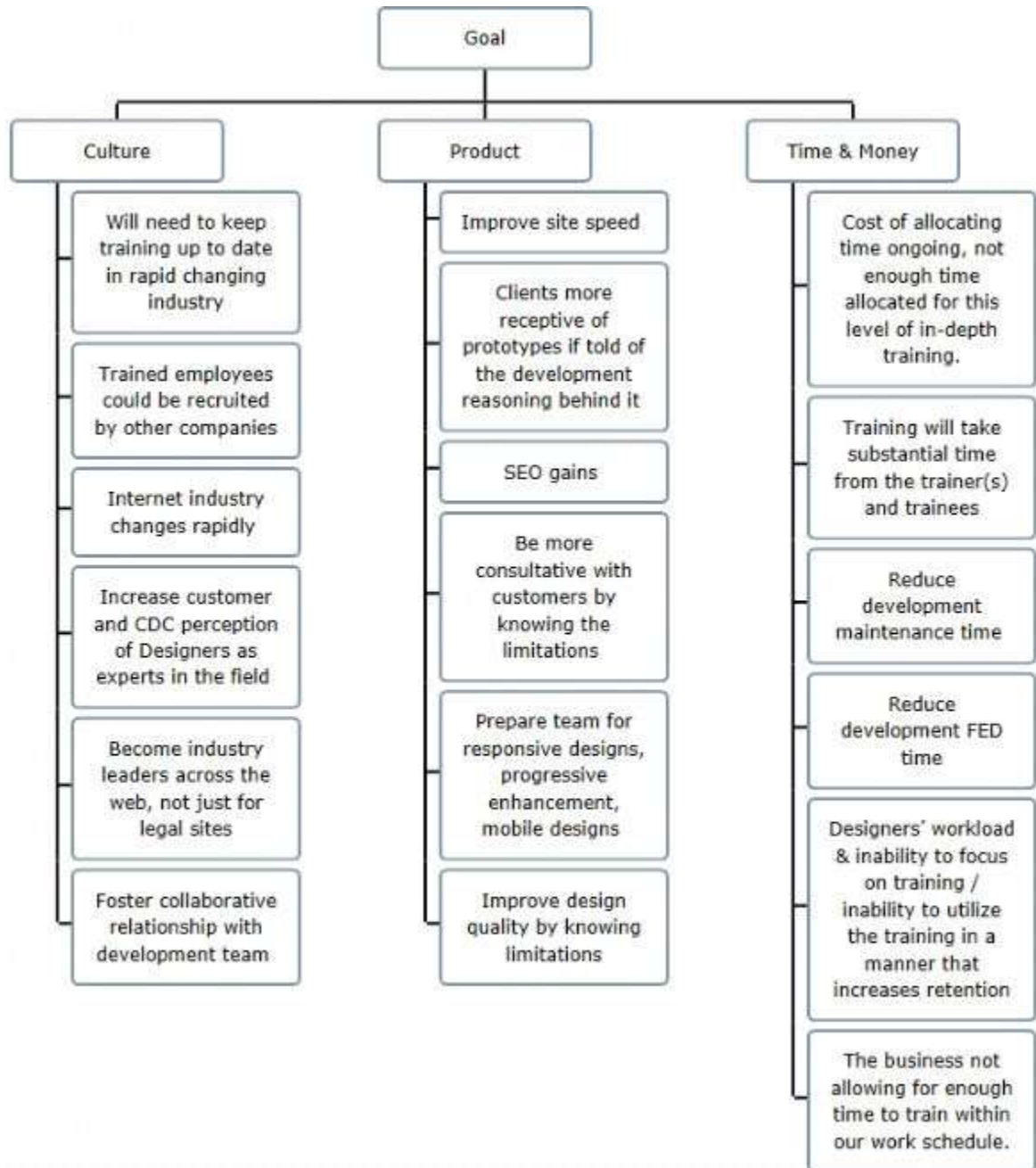
Figure 2. Hierarchy of SWOT Results.

The main categories of culture, product and time & money were selected since they aligned with

the SWOT criteria and how Company X values items in their current work environment. A

software packed from makeitrational.com was used to compute the pairwise comparisons and

their reflected weights. Pairwise comparisons were complete when the managers were in

agreement of the comparison level. If a hierarchy level had an inconsistency range of above

10% the comparisons were revisited to be under the acceptable range of 10% inconsistency

(Saaty, 1994, p. 27).

Limitations

The limitations of this are unique at each of its three collection phases. The skill survey

is limited by relying on self-reported information from the designers. A skills assessment test

would have resulted in the more accurate score. However, the administration of such a test

would have taken substantially too much time to create and test. The SWOT analysis is limited

by having to have been administrated online. A local meeting could have created a more robust

list of results and exploration into results which were not thought of during this study. The

online SWOT analysis, however, allowed for more participants over a longer period of time.

Finally, the pairwise comparisons were limited by having being completed in one meeting.

Revisiting the comparisons could have allowed for additional research to be brought towards the

comparisons. The method chosen for each step in the study compromised for the time allowed

by the business and the needs of the study.

Chapter IV: Results

The purpose of this study is to discover factors for the feasibility and scope of this training. Results gained from the this study are preliminary and will give Company X a first look at which factors will need to be considered when creating training and why training could be beneficial for the company.

Item Analysis

The skill survey was the first data collection tool used and was meant to help the later data collection stages in knowing where the design team stood in their current knowledge of web development. The first question rates the survey contributors' general knowledge of HTML and CSS. The average value of this question came to 4.59 out of 10 with a standard deviation of 2.59. Question two rates the designers' perceived knowledge of how their design is used for initial development; this is also called "sliced." 18 out of 22 respondents rated themselves at somewhat agree or agree. The last question in the survey was open to general comments or questions. Four responses were entered, two of which alluded to knowing how to build a website from scratch. Full survey results are found in appendix C.

The SWOT analysis was completed online using a collaborative document provided by Google Documents. Participants were given the link to visit the document and they added their results when their schedule allowed. The analysis returned 18 results and additional discussion notes from the participants.

The results from the SWOT analysis are found in appendix D. The three criteria with the most votes were

- Foster collaborative relationship with development team, 11 votes

- Training will take substantial time from the trainer(s) and trainees, 10 votes

- Prepare team for responsive designs, progressive enhancement, and mobile designs, 10 votes

The discussion thread of the SWOT analysis had some common themes. User1 said:

> I think the best part about this is it positions our designers on the call as true experts just as a firm might talk to at a small shop. This builds trust that often lacks between the project team and the client, thus making the client think they have to take control of a project and lengthen the duration.

This comment aligns with clients being more receptive to the designer's design and to FED durations. User2 makes a similar argument by saying, "One of the challenges I've learned from firsthand experience is that our clients often argue with the consult that we give them because they feel they are compelled to question our reasoning to provide more reasoning." This statement alludes to the criteria of clients being receptive of designs. User4 makes another similar statement which says:

> I think our designers are currently handicapped on the calls to push back against client/sales rep. requests that really don't make sense from a technical perspective because they can't necessarily explain the technical reasons supporting particular best practices. I think it would be a really nice change to have someone on the call that understands development.

One of the lowest voted on criteria in the analysis was, "Be more consultative with customers by knowing the limitations" with only one vote. This criterion is worded slightly differently from "Clients more receptive of prototypes if told of the development reasoning behind it," which received eight votes.

The analytic hierarchy process (AHP) provided the last set of results.

The hierarchy's top level consists of three main groups. The design and development managers'

ratings gave the groups the following weights.

Criteria	Weight
Time & Money	63.48
Culture	28.72
Product	7.8

Table 3. AHP Top Level Hierarchy Results

The top five weighted criterion from these three categories earned 70.04% of the total weight of

the data set. Table 4 details the top five weight earners in global and local weights.

Criteria	Global weight	Local weight
Training will take substantial time from the trainer(s) and trainees	27.26	42.95
Reduce development FED time	11.76	18.52
Reduce development maintenance time	11.33	17.85
Foster collaborative relationship with development team	9.96	34.68
Will need to keep training up to date in rapid changing industry	9.73	33.89

Table 4. Top Five AHP Results

The complete list of results can be found in appendix E.

Chapter V: Discussion

This study has gathered information in three separate stages. First, data was gathered to measure the current level of web knowledge from the participating design team. Secondly, a selected group of participants collaborated to create SWOT analysis on training the design team. Last the pairwise comparison was completed on the SWOT analysis criteria to create qualitative data so Company X can better use the SWOT analysis results.

Limitations

This study cannot resolutely say whether or not training the design team on web development will benefit Company X. Rather it should be used as a basis for decision makers to gather additional data on the subject. While there is currently an agreement from the design and development managers that training should occur, additional research that looks into cost, time, design of the training, and process improvement should occur before training decisions are made.

Conclusions

The skills survey's first question shows that the design team has an average HTML and CSS knowledge of 4.59. A value of five for this question is valued at "I can edit the code of an existing website and get the results I want." With the average survey participant being slightly below this level, Company X should consider where they want their design team to be in terms of web development competency. If training is to proceed, it should be considered where the acceptable level of web development competency should reside. This will help determine the design and scope of the training.

Questions two and three regard with the designers' knowledge of what happens with their PSD file during FED and maintenance development. The design team answered that 18 of 22 designers somewhat agree or agree that they know how their design is sliced for initial

development. The average for this question is four out of seven. It could be said that the

majority of respondents perceive that they have an understanding how their designs will be

sliced. Question three concerning how the design will be used has a lower average of 3.41. The

design team could be trained on how their designs are used in maintenance development if this

score is desired to be higher.

The analytic hierarchy process applied to our SWOT analysis returned five results with

70% of the global weight. The highest weighted criteria is, "Training will take substantial time

from the trainer(s) and trainees" with 27.26% global weight. This indicates that training is

perceived to be a time consuming activity for those involved. Whether this is correct will need

to be analyzed further. Additionally, a pilot training plan could be run with a select group of

designers to determine the length and feasibility of said training. The next two top weight

earners concern the reduction of development time in FED and maintenance development,

earning 11.76% and 11.33% global weight respectively. While the potential reduction in

development time is still theoretical, its potential impact on Company X was high enough for the

design and development managers to assign it a combined weight of 23.09%. The fourth highest

weighted criterion is, "Foster collaborative relationship with development team," with 9.96%.

This indicates that collaboration between design and development is of value to the mangers and

increasing collaboration could be important to Company X. Last of the top five criteria is, "Will

need to keep training up to date in rapid changing industry" with 9.73%. This criterion can be

interpreted in different ways. First, the Internet industry is rapidly changing and the design and

development mangers recognize this fact. By not having a current web development training

plan in place, the design team could fall behind the industry and there are risks involved with that

assumption. Secondly, this can be seen that any training put into place would need frequent updates and thus require more training for the design team.

Recommendations

The data suggests that training the design team could be a beneficial, yet time consuming task. Further analysis on the design, development, and implementation of the training should be studied. A training plan should be created and tested on a pilot group of designers to test the length the training program. The pilot training would also evaluate if gains were made in understanding HTML & CSS knowledge and if the designers' knowledge increases in how their designs are used in FED and maintenance development. A web knowledge baseline should be created for the design team. This will provide a basis for training and whether training is successful.

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Appendix A: SWOT Analysis Method Comparisons

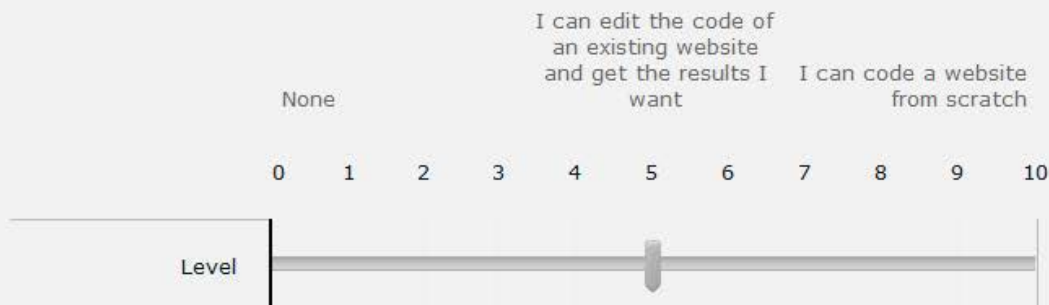| Chermack and Kasshanna (2007)	Kaufman et al. (2007)	DeSilets (2008)	Simoneaux and Stroud (2011)
1) Define the objective of the SWOT analysis 2) Provide an explanation of SWOT analysis procedures to participants 3) Ask individuals to consider their organization and list its strengths, weaknesses, opportunities and threats on a two-by-two matrix worksheet 4) Combine the individual worksheets into a single worksheet 5) Engage the group in dialogue and	1) Keep the purpose clear, do not use the SWOT analysis as a means unto itself. 2) Develop a classification system for data and rate for importance. 3) Discriminate between hard and soft data and have records to backup reasoning. 4) Identify relationship between internal strengths and weaknesses, and external opportunities and threats so strategies can be developed to achieve desired outcomes.	The process should be approached methodically and can take several directions, from brainstorming and nominal group technique, to using prescribed worksheets, to pulling together and analyzing hard data. These are not mutually exclusive. Foundational to the process is clear identification of SWOT to allow the unit to be better positioned to take action, deal with	1) Select a facilitator 2) Create a SWOT team 3) Select the venue for the SWOT analysis 4) Assemble the tools 5) Perform the environmental scan 6) Summarize 7) Analyze and prioritize

debate about the classification of each item 6) Develop specific actions for moving forward	5) Allow for sufficient time for the data to be collected. 6) Involve as many planning partners as possible in data generation.	issues, enhance strengths, take advantage of opportunities, bypass threats, and reduce weaknesses. (p. 196).	

Appendix B: *Design Team Survey*

This research has been reviewed by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46.

Web Knowledge

I would rate my current HTML and CSS knowledge as:

	None					I can edit the code of an existing website and get the results I want			I can code a website from scratch		
	0	1	2	3	4	5	6	7	8	9	10

Level

I know how my design will be sliced for initial development.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
	○	○	○	○	○	○

I know how my design will be used for maintenance development.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
	○	○	○	○	○	○

I would like like to learn more about:
(Select 3 to 4 items)

☐ Javascript & jQuery ☐ Publisher development

☐ Mobile development ☐ Our development process

☐ Progressive enhancement ☐ Product specific knowledge

☐ Browser support ☐ Development troubleshooting

☐ How features from WingDing work ☐ 3rd party development (Twitter, Facebook, etc.)

☐ Interactive development (non-Flash) ☐ HTML5/CSS3

Questions I have about HTML and CSS:

Appendix C: *Design Team Survey Responses*

1. I would rate my current HTML and CSS knowledge as:

Min Value	Max Value	Average Value	Standard Deviation	Responses
1.00	10.00	4.59	2.59	22

2. I know how my design will be sliced for initial development.

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree	Responses	Mean
0	1	3	13	5	0	22	4.00

Statistic	
Min Value	2
Max Value	5
Mean	4.00
Variance	0.57
Standard Deviation	0.76
Total Responses	22

3. I know how my design will be used for maintenance development.

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree	Responses	Mean
1	4	5	9	3	0	22	3.41

Statistic	
Min Value	1
Max Value	5
Mean	3.41
Variance	1.21
Standard Deviation	1.10
Total Responses	22

4. I would like like to learn more about: (Select 3 to 4 items)

#	Answer		Response	%
1	Javascript & jQuery		20	91%
2	Mobile development		13	59%
3	Progressive enhancement		3	14%
4	Browser support		1	5%
5	How features from WingDing work		5	23%
6	Interactive development (non-Flash)		9	41%
7	Publisher development		1	5%
8	Our development process		10	45%
9	Product specific knowledge		2	9%
10	Development troubleshooting		2	9%
11	3rd party development (Twitter, Facebook, etc.)		2	9%
12	HTML5/CSS3		18	82%

Statistic	Value
Min Value	1
Max Value	12
Total Responses	22

5. Questions I have about HTML and CSS:

Text Response
thanks!
I know from past discussions with my team that people fall all over the place regarding HTML / CSS knowledge. I would believe you would have GREAT participation if you and others provided targeted training from beginner - advanced. Perhaps have a few lessons/sessions.
How do I build a site in CSS from scratch?
Can you teach me to code a site from scratch, please?!?!

Appendix D: *SWOT Analysis*

Design Training on Web Development SWOT Worksheet

Goal of this SWOT

Identify the risks and benefits of training the design team on web development.

Definitions:

Internal: Within our origination (includes but not limited to: fellow coworkers, company policy, company technology, work environment, culture)

External: Outside our organization (includes but not limited to: clients, other companies, software/technology we don't have, job marketplace, economy, emerging technology)

If you agree with an item, please add an "x" in the parentheses. Use the space below the chart for discussion of these items.

	Positive	Negative
Internal	**Strengths** ● Foster collaborative relationship with development team (xxxxxxxxxxx) ● Reduce development FED time (xxxxxxxx) ● Reduce development maintenance time (xxxxxx) ● Prepare team for responsive	**Weaknesses** ● Training will take substantial time from the trainer(s) and trainees (xxxxxxxxxx) ● Will need to keep training up to date in rapid changing industry (xxxxxx) ● Designers' workload and inability to focus on training or inability to utilize the

	designs, progressive enhancement, and mobile designs (xxxxxxxxxx) ● SEO gains (xxxxx) ● Improve site speed (xxxxxx) ● Improve design quality by knowing limitations(x)	training in a manner that increases retention of knowledge.(xxx) ● The business not allowing for enough time to learn the necessary training within our work schedule.(x)
External	**Opportunities** ● Clients more receptive of prototypes if told of the development reasoning behind it (xxxxxxxx) ● Become industry leaders across the web, not just for legal sites(xxxxx) ● Increase customer and CDC perception of Designers as experts in the field (xxxxx). ● Be more consultative with customers by knowing the	**Threats/Challenges** ● Trained employees could be recruited by other companies (xxx) ● Internet industry changes rapidly (xxx) ● Cost of allocating time ongoing as there is not currently enough time allocated for this level of in-depth training.(xxx)

	limitations (x)	

Discussion:

- (Example): I think (example item) does not correctly fit with weaknesses. Perhaps this is actually an external problem?

- (Example2): I think (example item2) is a good example. I see this happen a lot.

User1 says "I think the best part about this is it positions our designers on the call as true experts just as a firm might talk to at a small shop. This builds trust that often lacks between the project team and the client, thus making the client think they have to take control of a project and lengthen the duration. Building trust through actual knowledge and expertise brings the conversation to approval so much faster. I know this from nearly five years of being on the phone with our clients. If I'm a client, I may think I want my site to be black with orange spikes and my face to be 500 pixels wide on the home page as an animated .gif because *"that's how you get their attention"* but if I have someone get on the phone with me who is up to date on latest industry best practices and development/design/usability techniques who says *"well, that's not in your best interest and here are all the reasons why"*, I'm going to realize that I'm the attorney, you're the experts and I should just pay my bill and say 'approved' if I know what's good for my bottom line." When I go to the doctor and I'm told I have brain cancer, I don't ask to look at the x rays to see if my headache is being caused by the eraser I stuck in my ear when I was 5. I just believe my doctor because I trust if he's delivering that message, he knows what he's talking about. We need to be more firm and directive with our clients to build trust and reduce project

durations. This plan will allow us to do that the only effective way possible: no fancy techniques, just facts and information.

User2 says "I think 'Cost of allocating time ongoing as there is not currently enough time allocated for this level of in-depth training.(x)' should be under internal not external. It seems like it would have more affect internally since most likely we would choose not to affect the external crowd, thus affecting us internally by getting creative on how to balance workload with training.

I also agree with User1's message. One of the challenges I've learned from first hand experience is that our clients often argue with the consult that we give them because they feel they are compelled to question our reasoning to provide more reasoning. They do this for a living, being lawyers. This often results in us ultimately giving in to make sure that the project gets out the door. But that is probably the exception to the rule; regardless designers could stand to be more consultative, especially when it comes to limitations. More importantly, from a career perspective, our designers need this type of training and practice developing it to become true web designers. We, as a business, get away with it because everything is so segmented and departmentalized, but regardless, it's a skillset that every web designer should know. It's like saying "I design cars for a living but have no idea how one works." On some levels, one might question that particular designer's talent because it's hard for them to gauge whether something they create will actually work or not. This results in this weird disconnect where the designer forces themselves into a limited design pattern that they know with 100% certainty will work instead of "wasting" time designing something that does not work."

User3 Says: Certainly designers would be stronger and more informed if they had some sort of development training. The important piece is to apply it to an actual project that they are inspired to complete, so that they could see something through and apply the principles/training. We've all had training and the next week your forgotten about because you don't apply it somehow. We can start with basic training and move to more complex development as we employ new aspects to that project.

User4: I know other people have already said a lot of this:

- I think on-going support is an internal cost

- This is a good professional development move for design. It'll help that team really become true WEB designers

- I don't see how it would be possible to move to a responsive design approach without doing this.

- I think our designers are currently handicapped on the calls to push back against client/sales rep. requests that really don't make sense from a technical perspective because they can't necessarily explain the technical reasons supporting particular best practices. I think it would be a really nice change to have someone on the call that understands development.

- It could help the designers better understand the implications of design choices on page weight/load time

- It could help developers and designs speak the same language when discussing what's possible for a particular site.

- It could also help designers serve as a check on developers. It's possible that developers sometimes push back against certain design element unnecessarily. Designers might take our word for it and not say anything to anyone. It might never get noticed.

- On the other hand, it could easily lead to strife between the teams if something really isn't possible but it seems like it should be based on the training.

- I generally feel like it would provide a number of intangible benefits, but I don't know if that'll be enough to justify it to the business.

- Training is hard. It takes a lot of time to do right. It always takes longer than I expect.

- I think it would be tough to strike the right balance on the training between teaching development and using time effectively. It doesn't seem like doing full FED training would be reasonable, but it could be tough to give the designers enough knowledge/experience to really get it without going that far.

Appendix E: *Analytic Hierarchy Process Results*

Culture

- Will need to keep training up to date in rapid changing industry

- Trained employees could be recruited by other companies

- Internet industry changes rapidly

- Increase customer and CDC perception of Designers as experts in the field

- Become industry leaders across the web, not just for legal sites

- Foster collaborative relationship with development team

Product

- Improve site speed

- Clients more receptive of prototypes if told of the development reasoning behind it

- SEO gains

- Be more consultative with customers by knowing the limitations

- Prepare team for responsive designs, progressive enhancement, mobile designs

- Improve design quality by knowing limitations

Time & Money

- Cost of allocating time ongoing, not enough time allocated for this level of in-depth training.

- Training will take substantial time from the trainer(s) and trainees

- Reduce development maintenance time

- Reduce development FED time

- Designers' workload & inability to focus on training / inability to utilize the training in a manner that increases retention

- The business not allowing for enough time to train within our work schedule

```
                                    ┌──────────┐
                                    │   Goal   │
                                    └──────────┘
           ┌──────────────────────────────┼──────────────────────────────┐
     ┌──────────┐                   ┌──────────┐                   ┌──────────────┐
     │ Culture  │                   │ Product  │                   │ Time & Money │
     └──────────┘                   └──────────┘                   └──────────────┘
```

Culture
- Will need to keep training up to date in rapid changing industry
- Trained employees could be recruited by other companies
- Internet industry changes rapidly
- Increase customer and CDC perception of Designers as experts in the field
- Become industry leaders across the web, not just for legal sites
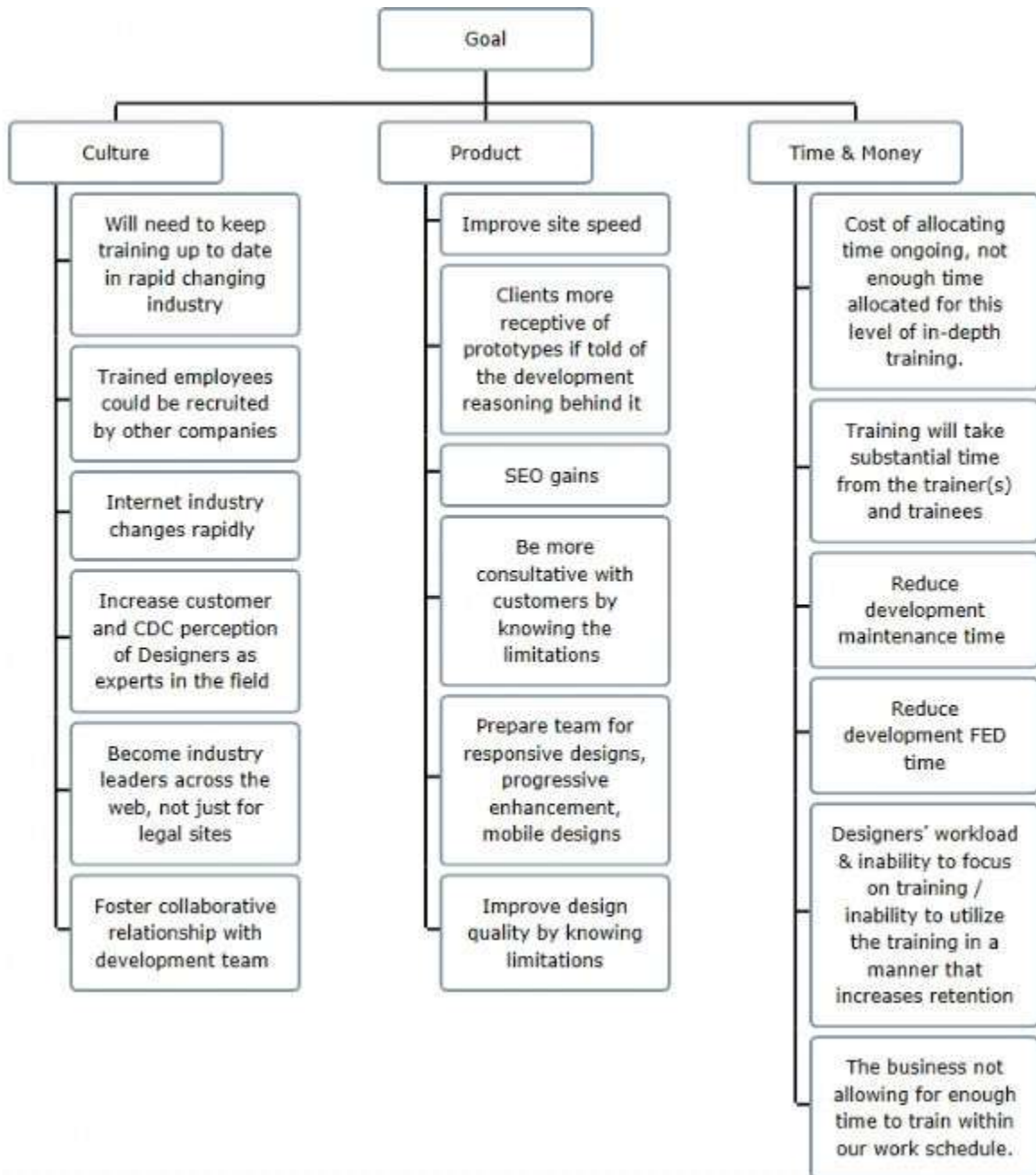- Foster collaborative relationship with development team

Product
- Improve site speed
- Clients more receptive of prototypes if told of the development reasoning behind it
- SEO gains
- Be more consultative with customers by knowing the limitations
- Prepare team for responsive designs, progressive enhancement, mobile designs
- Improve design quality by knowing limitations

Time & Money
- Cost of allocating time ongoing, not enough time allocated for this level of in-depth training.
- Training will take substantial time from the trainer(s) and trainees
- Reduce development maintenance time
- Reduce development FED time
- Designers' workload & inability to focus on training / inability to utilize the training in a manner that increases retention
- The business not allowing for enough time to train within our work schedule.

Preferences and Weights

Preferences in context of: Goal

Comparison	Rank
Time & Money vs. Culture	3 : 1
Culture vs. Product	5 : 1
Time & Money vs. Product	6 : 1

| Criteria	Weight
Time & Money	63.48
Culture	28.72
Product	7.8
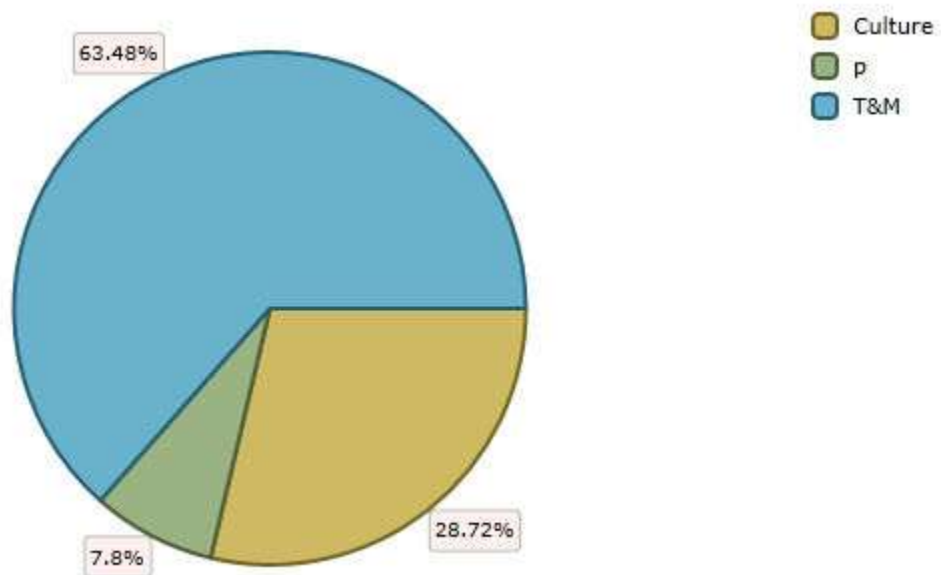
Preferences in context of: Culture

Comparison	Rank
Internet industry changes rapidly vs. Increase customer and CDC perception of Designers as experts in the field	5 : 1
Become industry leaders across the web, not just for legal sites vs. Trained employees could be recruited by other companies	4 : 1
Will need to keep training up to date in rapid changing industry vs. Increase customer and CDC perception of Designers as experts in the field	5 : 1
Will need to keep training up to date in rapid changing industry vs. Trained employees could be recruited by other companies	7 : 1
Increase customer and CDC perception of Designers as experts in the field vs. Trained employees could be recruited by other companies	2 : 1
Foster collaborative relationship with development team vs. Trained employees could be recruited by other companies	8 : 1
Will need to keep training up to date in rapid changing industry vs. Foster collaborative relationship with development team	2 : 1
Become industry leaders across the web, not just for legal sites vs. Increase customer and CDC perception of Designers as experts in the field	4 : 1
Foster collaborative relationship with development team vs. Become industry leaders across the web, not just for legal sites	6 : 1
Internet industry changes rapidly	6 : 1

vs. Trained employees could be recruited by other companies	
Internet industry changes rapidly vs. Become industry leaders across the web, not just for legal sites	4 : 1
Will need to keep training up to date in rapid changing industry vs. Internet industry changes rapidly	2 : 1
Foster collaborative relationship with development team vs. Internet industry changes rapidly	5 : 1
Will need to keep training up to date in rapid changing industry vs. Become industry leaders across the web, not just for legal sites	6 : 1
Foster collaborative relationship with development team vs. Increase customer and CDC perception of Designers as experts in the field	6 : 1

| Criteria	Weight
Foster collaborative relationship with development team	34.68%
Will need to keep training up to date in rapid changing industry	33.89%
Internet industry changes rapidly	16.59%
Become industry leaders across the web, not just for legal sites	7.79%
Increase customer and CDC perception of Designers as experts in the field	4.19%
Trained employees could be recruited by other companies	2.85%
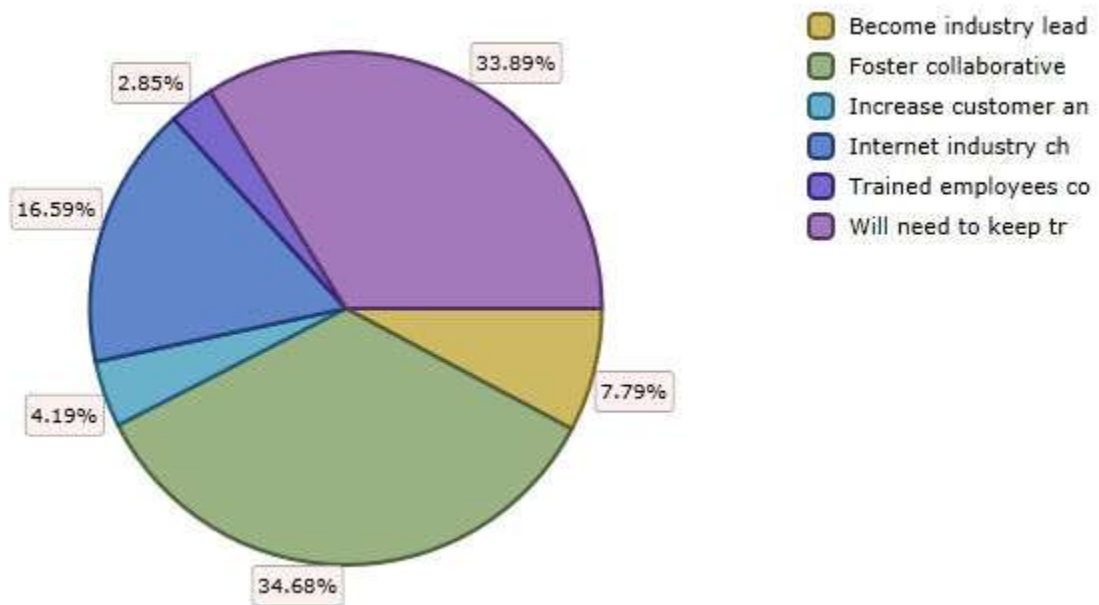
Preferences in context of: Product

Comparison	Rank
Improve site speed vs. SEO gains	1 : 1
Improve site speed vs. Be more consultative with customers by knowing the limitations	5 : 1
Improve site speed vs. Improve design quality by knowing limitations	6 : 1
Improve site speed vs. Clients more receptive of prototypes if told of the development reasoning behind it	4 : 1
SEO gains vs. Clients more receptive of prototypes if told of the development reasoning behind it	5 : 1
Improve design quality by knowing limitations vs. Clients more receptive of prototypes if told of the development reasoning behind it	1 : 1
Prepare team for responsive designs, progressive enhancement, mobile designs vs. Clients more receptive of prototypes if told of the development reasoning behind it	4 : 1
Prepare team for responsive designs, progressive enhancement, mobile designs vs. Be more consultative with customers by knowing the limitations	3 : 1
Prepare team for responsive designs, progressive enhancement, mobile designs vs. SEO gains	1 : 1
SEO gains	4 : 1

vs. Be more consultative with customers by knowing the limitations	
Prepare team for responsive designs, progressive enhancement, mobile designs vs. Improve design quality by knowing limitations	6 : 1
Improve design quality by knowing limitations vs. Be more consultative with customers by knowing the limitations	1 : 1
Be more consultative with customers by knowing the limitations vs. Clients more receptive of prototypes if told of the development reasoning behind it	1 : 1
SEO gains vs. Improve design quality by knowing limitations	7 : 1
Improve site speed vs. Prepare team for responsive designs, progressive enhancement, mobile designs	1 : 1

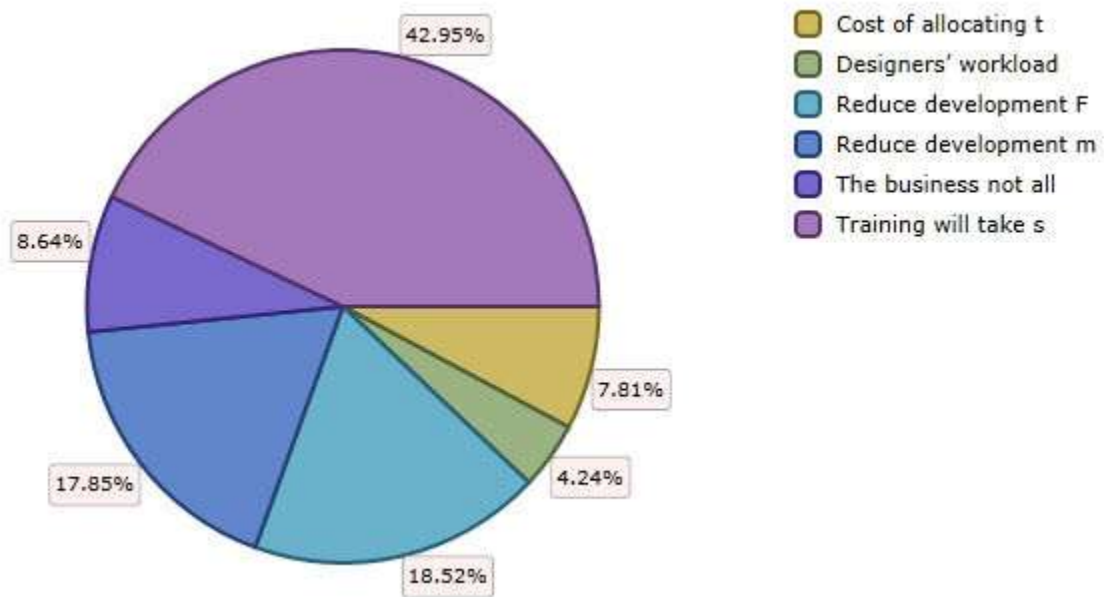| Criteria	Weight
SEO gains	28.71
Improve site speed	27.94
Prepare team for responsive designs, progressive enhancement, mobile designs	25.81
Be more consultative with customers by knowing the limitations	6.43
Clients more receptive of prototypes if told of the development reasoning behind it	6.06
Improve design quality by knowing limitations	5.05
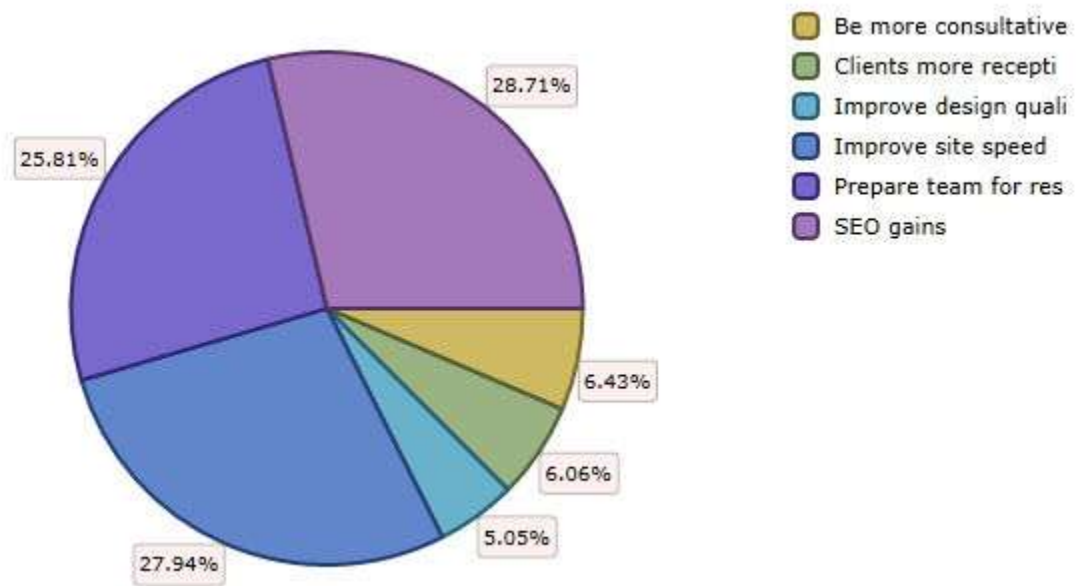
Preferences in context of: Time & Money

Comparison	Rank
Reduce development FED time vs. The business not allowing for enough time to train within our work schedule	4 : 1
Reduce development maintenance time vs. Cost of allocating time ongoing, not enough time allocated for this level of in-depth training	4 : 1
Training will take substantial time from the trainer(s) and trainees vs. Reduce development FED time	3 : 1
Training will take substantial time from the trainer(s) and trainees vs. Cost of allocating time ongoing, not enough time allocated for this level of in-depth training	5 : 1
Reduce development FED time vs. Cost of allocating time ongoing, not enough time allocated for this level of in-depth training	2 : 1
Reduce development FED time vs. Designers' workload & inability to focus on training / inability to utilize the training in a manner that increases retention	5 : 1
Cost of allocating time ongoing, not enough time allocated for this level of in-depth training vs. The business not allowing for enough time to train within our work schedule	1 : 1
Reduce development maintenance time vs.	3 : 1

The business not allowing for enough time to train within our work schedule	
Reduce development maintenance time vs. Designers' workload & inability to focus on training / inability to utilize the training in a manner that increases retention	4 : 1
Training will take substantial time from the trainer(s) and trainees vs. Designers' workload & inability to focus on training / inability to utilize the training in a manner that increases retention	5 : 1
The business not allowing for enough time to train within our work schedule vs. Designers' workload & inability to focus on training / inability to utilize the training in a manner that increases retention	2 : 1
Training will take substantial time from the trainer(s) and trainees vs. The business not allowing for enough time to train within our work schedule	2 : 1
Reduce development FED time vs. Reduce development maintenance time	1 : 1
Cost of allocating time ongoing, not enough time allocated for this level of in-depth training vs. Designers' workload & inability to focus on training / inability to utilize the training in a manner that increases retention	3 : 1
Training will take substantial time from the trainer(s) and trainees vs. Reduce development maintenance time	6 : 1

Criteria	Weight
Training will take substantial time from the trainer(s) and trainees	42.95
Reduce development FED time	18.52
Reduce development maintenance time	17.85
The business not allowing for enough time to train within our work schedule	8.64
Cost of allocating time ongoing, not enough time allocated for this level of in-depth training	7.81
Designers' workload	4.24

Criteria	Global weight	Local weight
Training will take substantial time from the trainer(s) and trainees	27.26	42.95
Reduce development FED time	11.76	18.52
Reduce development maintenance time	11.33	17.85
Foster collaborative relationship with development team	9.96	34.68
Will need to keep training up to date in rapid changing industry	9.73	33.89
The business not allowing for enough time to train within our work schedule	5.49	8.64
Cost of allocating time ongoing, not enough time allocated for this level of in-depth training	4.96	7.81
Internet industry changes rapidly	4.77	16.59
Designers' workload & inability to focus on training / inability to utilize the training in a manner that increases retention	2.69	4.24
Become industry leaders across the web, not just for legal sites	2.24	7.79
SEO gains	2.24	28.71
Improve site speed	2.18	27.94
Prepare team for responsive designs, progressive enhancement, mobile designs	2.01	25.81
Increase customer and CDC perception of Designers as experts in the field	1.2	4.19
Trained employees could be recruited by other companies	0.82	2.85
Be more consultative with customers by knowing the limitations	0.5	6.43
Clients more receptive of prototypes if told of the development reasoning behind it	0.47	6.06
Improve design quality by knowing limitations	0.39	5.05