Aug 11th, 12:00 AM

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Citation

Hsieh, E., Ma, M., and Lin, F. (2020) Designing by frontline tobacco-prevention practitioners: How can Design Thinking workshop affect the development of public health strategies?, in Boess, S., Cheung, M. and Cain, R. (eds.), *Synergy - DRS International Conference 2020*, 11-14 August, Held online.
<https://doi.org/10.21606/drs.2020.166>

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Designing by frontline tobacco-prevention practitioners: How can Design Thinking workshop affect the development of public health strategies?

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doi: <https://doi.org/10.21606/drs.2020.166>

Abstract: Design thinking features a distinct process for probing deep problems and ensuring that the right questions are being addressed and feasible solutions proposed. Recently, Taiwan's Health Promotion Administration took on design thinking as a method for redesigning several health-related public strategies. Although design thinking has been widely applied in several realms, more studies need to be conducted to ascertain its full effect. Therefore, this study attempts to understand how a Design Thinking Workshop could affect the development of public health strategies by using adolescent tobacco prevention as a case for research. The two-phase study included data collection and analysis for exploring the research topic. In conclusion, we found that participating in the process of a design thinking workshop helped establish a human-centred mindset. Further, the workshop resulted in the formation of concrete public policies that addressed fundamental root issues of adolescent tobacco prevention.

Keywords: design thinking; workshop; strategy development; tobacco prevention

1. Introduction

Recently, Taiwan's Health Promotion Administration (HPA) promoted design thinking as a method for redesigning several health-related public strategies. This paper presents one facet of the promotion: a case study of a Design Thinking Workshop that focused on adolescent tobacco prevention (ATP). The workshop was structured around design thinking principles and aimed to enable frontline practitioners to find critical insights and develop creative ideas.

The objective of this study is to understand how design thinking affects the development of public health strategies by using ATP as a case focus: We ask, "how can design thinking affect public strategy development?"

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This research collected data from a Design Thinking Workshop for ATP and analysed it through the steps listed below:

1. Generating core factors of ATP
2. Excerpting ATP strategies from proposals
3. Categorising strategies based on core factors of ATP
4. Mapping ideations with ATP strategies

It is hoped that answering the question raised above will contribute to our growing understanding of how and to what extent design thinking affects the development of public strategies.

2. Design Thinking Workshop for ATP

In this section, the author will briefly introduce the Design Thinking and Design Thinking Workshop that addressed adolescent tobacco prevention (ATP), which was hosted by the R&D team from the National Cheng Kung University (NCKU) in collaboration with the Health Promotion Administration (HPA), Ministry of Health and Welfare, Taiwan.

2.1 Design Thinking

Almost three decades ago, design thinking was defined as the cognitive process manifested in design activities that would help us understand how people “do” design (N. Cross, Dorst, & Roozenburg, 1992). The attribute of creativity is widely regarded as an essential element in design thinking (N. Cross, 2001). Research on design thinking attempts to identify the essential mental strategies of a designer instead of universal design methods (Tschimmel, 2012). Design thinking can be seen as a design process that has several connected stages and can be used rapidly and applied to other fields.

2.2 Workshop Setup

The Design Thinking Workshop was held on October 16, 2018. The mission of the workshop was to enable the frontline ATP professionals to gain critical insights and develop creative ideas related to the issue of ATP. The overarching frame for our workshop design was derived from design thinking principles. The workshop setup is depicted in Figure 1.

Figure 1 Design Thinking Workshop: discovering insights for ATP issues

SCHEDULE

The Design Thinking Workshop for ATP was a 5-hour program. First, the host introduced the concepts of design thinking for 30 minutes. Two exercises followed: “Discovering Problem Spaces” and “Defining Insights and Rapid Ideations,” each for one-and-one-half hours. In the final hour, all the participants were asked to share their findings and creative ideas. (See Figure 2)

Figure 2 Discovering and defining stages of the Design Thinking Workshop for ATP

SUBJECT AND PARTICIPANTS

There were a total of 71 participants in the workshop. Participants were from the HPA (N=8) and local public health bureaus (N=63) in Taiwan, except for Taichung City. The participants were the frontline tobacco-prevention practitioners. They provide smoking cessation counselling and health education services, as well as conduct regular inspections of tobacco retailers and youth smoking. The complete participant list is shown in Appendix A.

The participants were divided into eight groups, based on the results of ice-breaking activities. Each group was assigned a facilitator to assist the participants during the entire workshop.

HOST AND FACILITATORS

The workshop host had over 10 years of multidisciplinary teaching experience. The 10 experienced facilitators included 3 PhD students, 5 MS students, and 2 freelancers in the design field; one facilitator was assigned to each group. All the facilitators had several experiences in facilitating workshops and had been trained beforehand.

2.3 Issue of the Workshop: ATP

The Surgeon General's Report in the United States and myriad other reports have illustrated the problems, including fatal outcomes, attributable to tobacco use. People incur tobacco-related illnesses not only from active smoking but also by inhaling smoke, coming into contact with saliva from smokeless tobacco users, and touching tobacco leaves during farming or manufacturing processes. Smoking is the leading cause of preventable diseases such as chronic obstructive pulmonary disease, cardiocerebrovascular disease, and cancer (U.S. Department of Health and Human Services, 2014).

PREVENTION OF TOBACCO-RELATED DISORDERS IN TAIWAN

Creating a smoke-free environment for the next generation is valued across all nations. The goal for decreasing the number of smokers and minimising the impact of tobacco on the national health is to reduce the relative rate of use by 30% by 2025, rather than 2010 as stipulated by the World Health Organization. The United Nations Sustainable Development Goals target noncommunicable diseases, including tobacco-related diseases; they were adopted in the 2030 Sustainable Development Agenda by the United Nations General Assembly. The strengthening of tobacco control is, therefore, a pressing challenge worldwide. The Tobacco Hazards Prevention Act proposed by the HPA in Taiwan aims to strengthen tobacco control strategies, respond to hazards posed by novel products, protect the overall population, and help achieve multiple goals associated with global sustainable development.

ADOLESCENT SMOKERS AND TOBACCO HAZARDS

Nowadays, e-cigarettes are used by millions around the world. They first appeared on the Chinese market in 2004 (Brazier, 2018). The e-cigarettes contain harmful substances, including nicotine. Nicotine exposure during adolescence is harmful to learning, can impair the memory and ability to pay attention, and primes the brain for addiction; these effects can continue into the early to mid-20s. Youth who use e-cigarettes are more likely to go on to smoke conventional cigarettes or become dual users (Chen et al., 2018). Those who use multiple tobacco products when young are at a higher risk for developing nicotine dependence, might be more likely to continue using tobacco into adulthood, and may risk addiction to other drugs in the future (CDC, 2000; U.S. Department of Health and Human

Services, 2016). Future projections for deaths attributable to smoking are high. Virtually all tobacco use begins in adolescence. Starting to smoke cigarettes at an earlier age reinforces the likelihood that a person will continue to smoke and reduces the probability that a person will stop smoking.

3. Methodology

The methodology that contributed to this research will be briefly introduced in this section. It includes two qualitative and two quantitative research methods. Because of the limited time of the workshop, in this study, we applied the focus group technique to collect data from each group. Further, the affinity diagram is applied to break down complex data gathered from the workshop and reassemble them structurally. In the analysis phase, cluster analysis and correspondence analysis were used to mapping strategies and challenges for the tobacco prevention issue together. By illustrating the strategies and challenges, the biplot provided a clear view of the result for further discussion.

3.1 Focus Group

In the 1940s, Robert Merton developed the focus group. Generally speaking, a focus group saves time in investigations because researchers can collect data from a group of participants over the same time span (McQuarrie, Stewart, & Shamdasani, 2014).

Focus groups are currently widely used to (1) collect background information and define the subject of a study as the basis for the formation of research hypotheses, evaluations, or assessments; (2) investigate responses to policies; (3) pretest advertising or marketing efforts; and (4) conduct research on topics that are difficult to measure by one-to-one surveys (Carol Grbich, 1998).

3.2 KJ Method (Affinity Diagram)

The KJ method is a tool used to organise ideas and data that was initially developed by Kawakita Jiro in the 1960s; it is also known as the affinity diagram (Kawakita, 1991). People have been grouping data based on natural relationships for thousands of years. The KJ method does the same thing humans do, which is to break down complex problems and reassemble them structurally. The technique is used to establish hypotheses and theories by ordering facts in new ways and uncovering hidden insights in phenomena.

The KJ method is used to understand facts and find opportunities. Compared with other statistical methods, the KJ method does not quantify a phenomenon; rather, it uses the researcher's point of view as a tool to master questions. There is no specific result in the outcome of the KJ method other than to gain more understanding of a phenomenon. Although the KJ method is a subjective and qualitative research method, it can effectively promote teamwork to clarify priorities of a discussion and reveal observations and ideas in a short time.

3.3 Correspondence Analysis

Correspondence analysis permits visualisation to interpret and reveal relationships among categorical variables. The method determines which category variables are related and correspond with one another for which no specific hypotheses have been formed (Doey & Kurta, 2016). Correspondence analysis technically analyses two-way or multiway tables, with each row and column becoming a point on a multidimensional graphic map called a biplot (Doey & Kurta, 2016). The comparable pattern of counts is a descriptive data-reduction technique.

Correspondence analysis simplifies complex data and adds supplementary data points to better elucidate a model with flexible data requirements. Moreover, the method examines data validity and facilitates the treatment of outliers (Fellenberg et al., 2001; Hoffman & Franke, 2006). The characteristics that facilitate this form of analysis have been applied across numerous domains (Greenacre, 2017), including archaeology, ecology, and epidemiology (Sourial et al., 2010); geology and marketing (Hoffman & Franke, 1986); and sociology and psychology (Doey & Kurta, 2016).

3.4 Cluster Analysis

Cluster analysis identifies explorations and descriptions of data structures rather than hypothesis tests or conformations of theoretical structure (Henry, Tolan, & Gorman-Smith, 2005). Cluster analysis classifies similar variables according to their internal homogeneous and heterogeneous traits (Kaufman & Rousseeuw, 2009; Rousseeuw & Kaufman, 1990). Cluster analysis is a data-reduction technique for analysing interval, ordinal, or categorical datasets (Henry et al., 2005). Moreover, it can analyse data with a mix of categorical and numerical variables. Employing distinct statistical methods (e.g., K-means clustering, agglomerative hierarchical clustering, and density-based spatial clustering of applications of scans with noise) can generate different types of clusters from the same dataset. The concern is in choosing appropriate algorithms to detect, define, and evaluate meaningful clusters (Arabie & Hubert, 2003). Therefore, the validation and interpretation of cluster solutions affect the outcome.

Cluster analysis has played a critical role in a wide variety of fields: psychology and other social sciences, business, biology, statistics, pattern recognition, information retrieval, machine learning, and data mining (Henry et al., 2005).

4. Research Procedure

A two-phase study (i.e., data collection and analysis) was designed to explore our research topic. The research procedure is shown in Figure 3. Further information will be given in the following sections.

Figure 3 Research procedure

4.1 Data Collection

Our data concerned the challenges and ideations of ATP and a proposal for the 2019 ATP strategy.

CHALLENGES AND IDEATIONS OF ATP

Challenges and ideas were collected from the Design Thinking Workshop. By gathering the issues generated from the session on “Discovering Problem Spaces” of ATP, the research team gathered a total of 213 challenges (problems). In the final presentation of the workshop, 29 creative ideas were put forth by our participants.

PROPOSAL OF 2019 ATP STRATEGY

The proposal on the 2019 ATP strategy from the local Department of Health is provided by the HPA, Taiwan, and includes the original version reported before the workshop and the revised version stated after the workshop.

4.2 Data Analysis

Data analysis in this research can be divided into three main parts: (1) generating the core factors of ATP, (2) taking excerpts of ATP strategies from an annual proposal, and (3) adapting a quantitative research approach to make cross-comparisons between strategies (from an annual proposal) and ideas (raised at a workshop).

1. Generating core factors of ATP

In order to group the ATP issues accurately, a focus group was convened and eight R&D members were invited to sort data according to the affinity diagram (KJ method). After the focus group discussion, 213 original data items were sorted into 18 groups (Table 1).

Table 1 Eighteen Core Factors of Adolescent Tobacco Prevention

A	Smoking is attractive to people and fascinates them.
B	Advising underage persons to quit smoking is just inviting trouble.
C	Neglect of and indifference to the issue of underage smoking behaviour are real.
D	Seeing smoking behaviours can cause people to take up the behaviours.
E	Refusing a smoking invitation from others can make a person ashamed.
F	Smoking is an escape from the pressures of reality.
G	Cigarettes (e-cigarettes) are easy to purchase and obtain.
H	The attitude toward smoking is difficult to change.
I	Underage smokers deny that tobacco hazards exist and refuse to face their possible effects.
J	Underage smokers tend to ignore the regulations of the Taiwan Health Promotion Administration.
K	Difficulties in making inspections are caused by limited human resources.
L	Difficulties in inspection because of Insufficient regulations.
M	Verifying the illegality of underage smoking is difficult.
N	Awareness of the harm caused by smoking behaviours is insufficient.
O	Tobacco cessation intervention could not significantly influence young people.
P	Tobacco cessation intervention would be annoying for young smokers.
Q	Resources for and guidelines about tobacco cessation are lacking.
R	It is not easy to quit smoking, but it is easy to continue to smoke.

The core factors of ATP generated in this section reflect the space of the overall problem and reveal the critical issues related to ATP. The 18 core factors of ATP were used for further analysis with the strategies discussed in this study.

2. Excerpting ATP strategies

To reveal the benefits of involving design thinking in tobacco prevention, this research excerpted strategies from the annual proposal of the local Department of Health. Because adolescent smoking behaviour is different from area to area, this research selected two cities and five counties in Taiwan as our target areas. They were comparable to having a high adolescent smoking rate and low rate of decline in smoking behaviours between 2014 and 2016. Based on the Taiwan Tobacco Control Annual Report of 2016, the two cities and five counties selected were Keelung City, Taoyuan City, Hsinchu County, Nantou County, Pingtung County, Taitung County, and Hualien County.

Regarding the topic of the workshop, this research excerpted only the strategies on ATP from the proposal. Similar approaches in the original proposal were combined, so that 23 plans were eventually identified. By comparing the original and revised versions of the proposal, the R&D team identified another 19 strategies that had been added. A total of 42 strategies were excerpted. A more detailed explanation of each strategy can be gained from Appendix B.

3. Mapping ideations with ATP strategies

After the data were collected and sorted according to the qualitative research approach, this study looked further into the influence of design thinking by applying the cluster and correspondence analyses. Findings of the cross-comparison will be discussed in the next section. The matrix of an evaluated score for the relationship between the ATP factors and strategies is shown in Appendix C.

5. Results

In this section, we focus on the results of the qualitative analysis. Results of the cluster and correspondence analyses will be presented clearly.

5.1 The Result of Strategy Clustering

A cluster analysis using Ward's method is schematically presented in Figure 4. The core factors from Table 1 were used to classify the strategies in this study, and they were grouped into three categories. By referring to the original data, similarities in group characteristics can be identified.

Each group contained original and newly added strategies. None of the categories had only revised strategies or original strategies. Based on the statistical results, we can see that the new strategies shared similarities with the original ideas (or considered the same ATP factors).

Figure 4 Dendrogram for ATP strategies

5.2 Correspondence Analysis Between Factors and Strategies

In regard to the results of the correspondence analysis (Table 2), we first look at the chi-square test. The value of sig. (or p -value) is lower than .001, which indicates that our total inertia value is significantly different from zero. There is a relationship between the ATP factors and strategies. Second, the total inertia is 97.9%, which indicates that for our

model, some aspect of the ATP factors explains approximately 97.9% of the strategies. The association is quite strong. In our model, dimension 1 explains approximately 46.1% of the total of 97.9% of the variance shown in the model, whereas dimension 2 explains 16.4%.

Based on the statistical result of the correspondence analysis, we can go deeper into the other factors and strategies.

Table 2 Summary of Correspondence Analysis of ATP Factors, Strategy of 2019

Dimension	Singular Value	Inertia	Chi-square	Singular Value signifies	Proportion of Inertia		Confidence Standard Deviation	Singular Value
					Accounted for	Cumulative		Correlation 2
1	.672	.451			.461	.461	.005	.070
2	.400	.160			.164	.625	.008	
3	.301	.091			.093	.717		
4	.246	.060			.062	.779		
5	.216	.047			.048	.826		
6	.193	.037			.038	.864		
7	.178	.032			.033	.897		
8	.149	.022			.023	.920		
9	.141	.020			.020	.940		
10	.125	.016			.016	.956		
11	.107	.011			.012	.968		
12	.101	.010			.010	.978		
13	.096	.009			.009	.988		
14	.070	.005			.005	.993		
15	.057	.003			.003	.996		
16	.050	.003			.003	.999		
17	.038	.001			.001	1.000		
Total		.979	18310.906	.000 ^a	1.000	1.000		

a. 697 degrees of freedom

For a visual picture of the correspondence analysis result, see the graphic representation in Figure 5. The yellow-cross marks signify the 18 core factors of ATP, and the blue-triangle and red-circle marks stand for the original and revised strategies, respectively.

6. Discussion

By combining the results of the cluster and correspondence analyses, three main groups are seen in the correspondence analysis biplot (Figure 5). Tracking back to the raw data on the strategies, the groups can be named (1) education and campaign, (2) inspection and training, and (3) smoking cessation services.

Figure 5 Three categories of ATP strategies

6.1 Review of DT Workshop and Public Strategy Development

By mapping the ideas and strategies, the researcher found that 28 of 29 ideas suggested by our workshop participants could be mapped to the list of 42 strategies. Eleven ideas were related to the 23 original strategies and 17 ideas to the 19 newly added strategies.

The 28 strategies related to the workshop ideas are illustrated in Figure 6. The mapping result lends support to the theory that;

- Ideas generated from the workshop were general and seemed to be correlated with new strategies proposed after the workshop.
- The Design Thinking Workshop focused on both past ideas and new ideas.

Figure 6 Strategies related to ideas generated in the Design Thinking Workshop for ATP

A quick look at Figure 6 reveals that ideas generated in the workshop were mainly from the education and campaign group and inspection and training group. There was only one new strategy related to new ideas in the smoking cessation services group. The ideas generated by the frontline practitioners usually focused on preventing smoking behaviours in teenagers who had not started to smoke rather than stopping them in teenagers who were already smoking. This finding is in accord with the results of previous studies of the ideations of design thinking workshops, although those studies focused on different issues. Bennett (2016) presented findings from a workshop on designing ways for persons with disabilities to have more options for accessibility. Participants found several access barriers and ideations that prevented disabled persons from contributing on an equal basis (Bennett, Shinohara, Blaser, Davidson, & Steele, 2016, p. 304). The outcome was similar to our research findings, which also focused on prevention. Lindberg et al. (2011) argued that design thinking is limited to fuzzy front-end matters. They found that ideations derived from the process usually did not survive when they came into conflict with established development processes, corporate rewards, and reporting and controlling systems (Lindberg, Meinel, & Wagner, 2011). According to our results, it is likely that issues related to smoking cessation services are too narrow and rigid or generating ideas. Our research results led to the finding that;

- The Design Thinking Workshop tends to lead participants to focus on prevention rather than cessation and is limited to fuzzy front-end matters.

6.2 Review of Seventeen Newly Added Ideas and Strategies

Based on the structure of the three categories, one can explain the insights by comparing the original and revised strategies related to the 17 workshop ideas. The strategies are presented in Appendix B, and the number appears in brackets for easy checking.

EYE-CATCHING EDUCATION AND CAMPAIGN

Based on the raw data, the original strategies seemed to primarily focus on establishing a smoking-free supportive environment (i.e., family home and school campus). The existing strategies (before the workshop) included board games [10] that included warnings about the effects of tobacco on health, a letter to parents encouraging them to quit smoking [7], smoking cessation courses [11] (courses on quitting smoking for underage smokers), and training for enforcement personnel [22].

After the Design Thinking Workshop, the new strategies on education and campaigning focused more on their targets. For example, some strategies [28] involved using virtual reality antitobacco games to arouse an adolescent's interest. Strategies [36] presented by Pingtung County involved inventing antitobacco board games and other campaigns in indigenous languages because 7.25% of residents were indigenous (Department of Statistics, Ministry of the Interior, 2019).

NOVEL INSPECTION AND TRAINING

The category of inspection and training was the largest of the three categories, and its three main topics were (1) inspection [1, 9, 20]; (2) banning tobacco advertising and marketing, and [3] promoting tobacco control campaigns.

Several strategies were generated in the workshop. One involved addressing the low rate of reporting instances of smoking. It was suggested that paying someone who reports illegal smoking may act as an incentive to the public [26]. If reporting another person's illegal act were rewarded instead of causing trouble, people might be willing to report such an act. Another suggestion involved educating tobacco sellers about teenage smokers. The rate for selling tobacco to teenagers has remained the same over the past 5 years (HPA of Taiwan, 2018). Nantou County tried a new strategy to educate long-time tobacco sellers by posting tobacco-control campaign posters with words in large fonts where they could see them and by offering them one-on-one antitobacco training [34]. To encourage sellers to keep the antitobacco posters, Pingtung County professionals provided "antitobacco promotion cards in the shape of a sycee" [37] for them. The shape of the sycee indicates "great fortune" in Taiwan, and this might impel a tobacco seller to keep the cards.

ENERGETIC SMOKING CESSATION SERVICES

Smoking cessation services in place before the workshop included antitobacco courses

[14] and self-monitoring, progress tracking [13], carbon monoxide monitoring [13], and a smoker's helpline [18, 23].

After the workshop, regular exercise [24] was added to the smoking cessation efforts [24]. A new strategy, health promotion clubs, was provided by Keelung City for underage smokers. Because the impact of peers is much more powerful than that of others, the clubs were set up as friendly societies for helping underage smokers and engage in sports activities that would boost their health and serve as an alternative to smoking.

The review of the insights described above, which were suggested during a Design Thinking Workshop, suggests that there is some benefit in involving design thinking in public strategy development. The result shows that the development of strategies no longer occurs only by professionals. In the findings and insights listed, one can see that the ideas that emerged from the Design Thinking Workshop embraced empathy-based thinking. This finding is in accord with the results of previous studies. Fabrizio and Elena noted that a project-based approach (e.g., workshop) suggested much more emphasis on collaboration and empathy than a traditional approach (Pierandrei & Marengoni, 2017, p. 925).

7. Conclusions

This study proposes that design thinking can affect the development of a public health strategy by focusing on a case study of a Design Thinking Workshop. The researcher remains perfectly aware that the validity of any experimental study is limited to the scope of the experiment. Thus, the generalisation of the result of this study to another field may have limited use. This study has taken a step toward defining the relationship between design thinking and public health strategy development.

In the big picture, this study shows that design thinking contributes to the further consideration of the challenges and problems of people but does not contribute to the expansion of a new domain of strategy. The result of the Design Thinking Workshop for ATP shows that strategy development is no longer only the purview of professionals in the field. Ideas and strategies both arise from the engagement of stakeholders in ATP issues.

To summarise the salient features of the analysis, we look at several findings of interest. The application of design thinking to public strategy development had three main facets. First, based on the characteristics of design thinking, a human-centred design process, participants not only shared new ideas but also considered existing ideas if the ideations were related to stakeholders with whom they empathise. Second, considering the mapping between ideas and strategies, the ideas raised in the Design Thinking Workshop were very similar to the strategies proposed after the workshop. Last, the Design Thinking Workshop tended to lead participants to focus on prevention rather than cessation and limited them to fuzzy front-end matters. We found that participating in the process of a Design Thinking Workshop helped establish a human-centered mindset. Further, the workshop resulted in the formation of concrete public policies that addressed fundamental root issues.

Although this study has its limitations, it is hoped that it can serve as a basis for further studies on strategizing during a Design Thinking Workshop. In the future, we will study whether a Design Thinking Workshop could have the same effect in other realms.

Acknowledgement: We would like to thank the following people for helping with this research project: Chief secretary, YR Wang, and the representatives, CS Chang, SY Luo and YJ Yeh, from Health Promotion Administration, Ministry of Health and Welfare, Taiwan, for their willingness to support and participate the design thinking workshop. Assistant Prof. Wen-Ling Chang for providing practical advice to this research project. Last, all the team members in Lab Ma who have been a great source of support.

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Fu-yu Lin, is a master student of Arizona State University. Her research interest is focus on the bussiness analytics and data visualization.

Appendix A

List of Workshop Participants

Employer	Position	Number in Attendance
Health Promotion Administration, Ministry of Health and Welfare	Chief secretary, section chief, director, associate technical specialist, secretary, and contract employee	8
Department of Health for		
Keelung City Government	Section chief	1
Taipei City Government	Section chief, section chief, head, and planner	5
New Taipei City Government	Head, officer	3
Taoyuan City Government	Chief secretary, junior and associate technical specialists	3
Hsinchu City Government	Special assistant	2
Hsinchu County Government	Section chief	2
Miaoli County Government	Section chief, associate technical specialist, and research assistant	5
Changhua County Government	Section chief, associate technical specialist, and case officer	3
Nantou County Government	Associate technical specialist, project specialist, and public health instructor	3
Yunlin County Government	Section chief, junior and associate technical specialists, and special assistant	5
Chiayi City Government	Section chief, associate technical specialist, and special assistant	3
Chiayi County Government	Section chief, project specialist, and head nurse	4
Tainan City Government	Head and associate technical specialist	2
Kaohsiung City Government	Head and project assistant	2
Pingtung County Government	Associate technical specialist and project assistant	4
Taitung County Government	Associate technical specialist, project assistant, and contract employee	3
Hualien County Government	Associate technical specialist and project assistant	4
Ilan County Government	Section chief, associate technical specialist, and public health inspector	3
Penghu County Government	Deputy minister, special assistant, and temporary project assistant	3
Kinmen County Government	Contract employee	1

Lienchiang County Government	Project assistant	2
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Appendix B

Forty-two Strategies for Adolescent Tobacco Prevention from the Annual Proposal of the Local Department of Health

Original Strategies: 23	
1.	Strengthening inspections at the common site of violations (e.g., Convenient store, hospital)
2.	Counseling cigarette sellers to join the “guardian alliance”
3.	Strengthening training for tobacco-store staff (age recognition, etc.)
4.	Informing citizens about the hotline connected with (high) schools and the local Department of Health
5.	Hiring temporary staff for illegal inspections
6.	Using textbooks and other teaching materials to enhance awareness of the effects of second-hand smoke/third-hand smoke and e-cigarette vapors on children
7.	Sending flyers and letters to parents encouraging the quitting of smoking for the building a smoke-free environment effort
8.	Promoting smoke-free environments on campuses and nearby covered walkways
9.	Inspecting smoking hotspots (medical institutions, entertainment venues)
10.	Generating games to be used as teaching materials (e.g., e-cigarette turntable, tobacco prevention board game)
11.	Defining antitobacco activities (e.g., refusing to be around second-hand smoke, refusing offers of cigarettes from peers, being aware of emotional manipulation)
12.	Promoting sports activities and expanding awareness of the harm caused by tobacco
13.	Testing and recording levels of exhaled smoke (e.g., providing education on the addictive properties of nicotine) and providing follow-up counseling (smoking cessation services) to underage smokers
14.	Providing one-on-one health education (smoking cessation services) for dropouts and high-risk students
15.	Providing smoking cessation services in cooperation with the Joint Ministry of Education, external units, and schools
16.	Setting up penalties (payments and smoking cessation services) for students who are violating the Tobacco Hazards Prevention Act
17.	Interviewing and counseling parents of students who smoke
18.	Providing smoking cessation counseling and health education services in combination with community medical resources
19.	Banning tobacco advertising, promotions, and sponsorships
20.	Strengthening inspections of e-cigarettes and monitoring the selling of e-cigarettes on the internet
21.	Providing and renewing health warning campaigns and signs
22.	Training personnel to enforce the smoking cessation services and generate teaching materials

23.	Providing a free smokers' helpline for adolescents
New Strategies (added to the revised version of the proposal): 19	
24.	Setting up health promotion clubs, which are friendly societies for underage smokers that provide a place in which they can build trust and try to quit smoking together through sports activities
25.	Monitoring websites on which tobacco is sold illegally
26.	Setting up payment rewards for the public to serve as incentives for reporting illegal underage smoking and selling
27.	Providing antitobacco board games that can be released on social networks
28.	Providing visual reality experiences for improving teens' abilities to refuse tobacco and strengthen awareness
29.	Posting mystery shopper reports on age verification for tobacco purchases
30.	Counseling tobacco sellers not to promote the sale of tobacco products to teenagers
31.	Investigating sources of tobacco supplied by students using the smoking cessation services
32.	Counseling tobacco traders and strengthening inspections to reduce illegal smoking
33.	Asking schoolteachers to cooperate with the HPA in providing SCSs for underage smokers
34.	Putting up posters with words in large fonts that promote one-on-one health efforts for elderly persons who sell cigarettes
35.	Testing and recording levels of exhaled co-values and providing follow-up counseling (for group /individual smoking cessation services)
36.	Providing unique teaching materials and campaigns in indigenous languages
37.	Providing an "antitobacco-promotion card in the shape of a gold ingot" for tobacco sellers
38.	Posting mystery shopper reports on age verification for tobacco purchases
39.	Informing people about the hotline connected with (high) schools and the local Department of Health
40.	Offering a lecture on campus on a smoke-free environment
41.	Encouraging parents to sign a quit-smoking commitment to build a smoke-free environment
42.	Providing parenting education for the parents of dropouts and high-risk student

Appendix C

Matrix of Evaluated Relationship between Factors and Strategies

Factors	18 Core Factors of Underage Tobacco Hazards Prevention																	
Strategy	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
01	11	11	11	33	33	0	56	11	0	56	56	33	67	22	11	11	0	11
02	0	44	11	11	11	0	100	0	0	33	33	67	56	0	11	0	0	0
03	0	33	22	0	0	0	89	0	0	44	56	44	67	0	11	11	0	0
04	0	56	56	11	0	0	22	11	0	11	89	56	56	11	11	11	22	11
05	0	0	11	0	0	0	44	0	0	11	89	56	89	0	0	0	0	0
06	44	22	67	67	22	0	11	33	33	33	0	0	0	78	33	56	11	0
07	56	33	89	100	0	11	56	22	22	11	11	0	11	56	22	11	0	0

08	11	33	11	33	11	0	22	0	22	56	56	11	33	11	11	11	0	0
09	11	22	11	56	33	11	56	0	11	33	44	67	78	0	11	11	0	0
10	56	11	11	56	22	56	11	33	78	11	0	11	0	100	56	78	0	11
11	44	33	22	67	100	100	11	33	22	22	0	22	0	67	33	22	11	0
12	33	33	22	33	33	67	0	44	33	11	11	11	0	67	44	56	11	22
13	22	0	11	11	11	22	11	22	44	11	22	11	11	44	67	11	78	100
14	11	22	44	22	11	11	11	56	67	11	44	11	11	78	67	56	67	44
15	11	44	33	11	11	11	22	22	33	33	44	11	0	44	33	22	22	11
16	0	0	11	11	0	11	11	33	0	89	22	22	11	0	11	0	0	33
17	0	44	100	22	0	0	11	11	22	33	0	11	11	33	33	33	11	33
18	11	22	11	0	0	11	0	22	33	11	11	22	0	56	44	22	89	33
19	44	11	11	78	0	0	100	0	0	33	11	44	11	22	0	0	0	11
20	22	11	0	33	0	0	100	0	11	67	22	67	44	33	0	0	0	22
21	44	22	22	33	0	11	0	33	44	33	0	11	22	89	22	11	0	0
22	0	11	33	11	11	0	0	22	11	22	11	11	0	44	89	89	22	11
23	0	11	11	0	0	11	0	22	22	11	22	0	0	33	44	22	78	56
24*	33	33	44	56	11	78	0	44	56	22	33	11	0	44	100	67	56	67
25*	0	22	11	0	0	0	78	0	0	56	44	56	67	0	11	0	0	11
26*	0	44	11	0	0	0	78	0	11	89	78	67	67	0	11	0	0	11
27*	56	22	22	56	0	33	11	33	44	11	11	0	0	67	22	44	0	11
28*	33	22	33	44	89	22	0	33	56	11	11	11	0	78	56	67	11	0
29*	0	0	0	0	0	0	89	0	0	22	33	22	67	11	0	0	0	11
30*	22	33	11	22	0	0	89	33	22	44	44	33	22	67	22	22	0	11
31*	0	0	0	0	0	0	89	0	0	44	56	44	89	22	22	11	0	11
32*	0	33	0	0	0	0	100	0	0	56	56	44	78	0	11	11	0	11
33*	11	44	44	11	11	0	67	22	22	56	67	67	22	22	11	22	0	11
34*	11	22	33	11	0	0	100	0	11	56	22	11	33	33	44	22	0	0
35*	11	22	44	44	44	44	0	33	44	11	0	11	0	56	89	56	78	100
36*	22	33	33	33	33	11	11	22	44	11	0	11	0	78	67	67	11	0
37*	0	33	0	11	0	0	100	0	0	78	33	44	67	11	11	11	0	0
38*	0	11	0	0	0	0	78	0	0	33	33	44	89	0	0	0	0	11
39*	0	44	33	11	33	0	56	22	11	11	67	33	44	11	11	11	0	11
40*	44	33	22	44	11	11	0	22	56	11	11	0	11	67	22	44	0	0
41*	11	67	100	56	0	0	44	11	33	11	22	11	0	22	0	11	0	0
42*	11	44	100	22	0	11	11	22	44	33	11	0	11	78	56	22	22	11

* Strategies added after Design Thinking Workshop