

CAN ONLINE WAIT BE MANAGED? THE EFFECT OF FILLER INTERFACES AND PRESENTATION MODES ON PERCEIVED WAITING TIME ONLINE

Younghwa Lee

Department of Management, College of Business Administration, University of Northern Iowa,
Cedar Falls, IA 50614 U.S.A. {gabe.lee@uni.edu}

Andrew N. K. Chen

Accounting and Information Systems, School of Business, University of Kansas, 1300 Sunnyside Avenue,
Lawrence, KS 66045 U.S.A. {achen@ku.edu}

Virginia Ilie

School of Management, California Lutheran University, 60 West Olsen Road,
Thousand Oaks, CA 91360 U.S.A. {ilie.virginia@gmail.com}

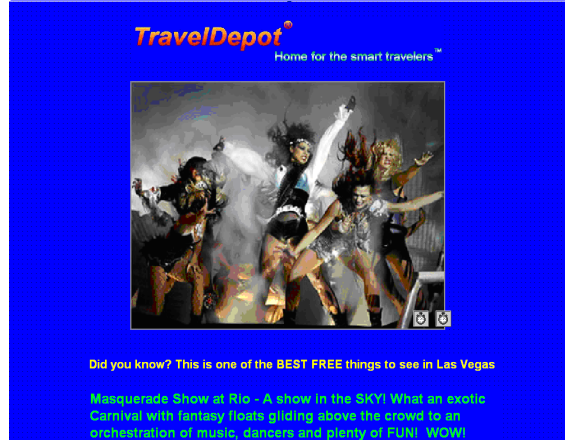
Appendix A

Input Screens, Filler Interfaces, and Output Screens for the Simulated Online Travel System

Generic Filler Interface Condition



Relevant Filler Interface Condition



Appendix B

Instrument Items

Construct	Items	Description
Focused Immersion*	FI1	I was intensely absorbed in a filler interface while waiting to see the results.
	FI2	My attention was focused on a filler interface while I was waiting to see the results.
	FI3	I concentrated fully on a filler interface while waiting to see the results.
	FI4	I was deeply immersed in a filler interface while waiting to see the results.
Temporal Dissociation	TD1	Time appeared to go by very quickly while waiting to see the results.
	TD2	I lost track of time while waiting to see the results.
	TD3	I was unconscious of the passage of time while waiting to see the results.
	TD4	Time seemed to fly while I was waiting to see the results.
	TD5	While waiting to see the results, I forgot the passage of time
Heightened Enjoyment	HE1	Waiting for the requested results in the filler interface was: Pleasant
	HE2	Enjoyable
	HE3	Fun
	HE4	Exciting
PWT	PWT1	Your online wait to see the requested results was: Fast
	PWT2	Speedy
	PWT3	Quick
Affective Appraisal	AA1	My overall experience with the Web site was: Happy
	AA2	Good
	AA3	Relaxed
	AA4	Likable
	AA5	Satisfactory
Cognitive Appraisal	CA1	The Web site was effective for achieving the goal of my visit.
	CA2	The Web site was convenient for attaining the goal of my visit.
	CA3	I felt comfortable using the Web site to achieve the goal of my visit.
	CA4	The Web site was helpful for achieving the goal of my visit.
Use Intention	UI1	If I needed this service in the future, I would probably revisit this Web site.
	UI2	I would recommend this Web site to others who are interested in this service
	UI3	If I needed this service in the future, I would probably try this Web site again.
Perceived Relevance**	PR1	Image/text provided in a filler interface was informative to me.
	PR2	Image/text provided in a filler interface was valuable to me.
	PR3	Image/text provided in a filler interface did matter to me.
	PR4	Image/text provided in a filler interface was helpful to me.
	PR5	Image/text provided in a filler interface was useful to me
Perceived Image Motion	IM1	I feel that the image showing in a filler interface is in motion.
	IM2	I feel that the image showing in a filler interface is moving.

Note: Seven-point Likert-type scales were used to measure the items above (1 = strongly disagree to 7 = strongly agree) except for perceived relevance, which uses five-point scales.

*In the no-filler interface condition, subjects did not see a filler interface and thus we could not directly use the same items to measure "focused immersion on the filler interface." Instead, we used items to measure "focused immersion on waiting" (e.g., I was intensely absorbed in the waiting while waiting to see the results). After gathering the data, we reverse coded the items for the no-filler interface condition before conducting our ANOVA tests. The derived scores for both the no-filler and the filler interface conditions represented the degree of distracted attention from waiting itself.

**For pretests of perceived relevance and image motion, we did not include the wording "in a filler interface" in items.

Appendix C

Pretests for Study 3

Independent Variables

In order to develop the treatment conditions for the relevance of text and images, we first recruited 15 subjects who had at least 1 year of usage experience with travel Web sites and had visited the destination city (Las Vegas) at least once. After explaining the purpose of our study, we asked them to identify three highly relevant texts/images and three generic (i.e., low relevant) texts/images pertaining to the search outcome (e.g., Las Vegas). The operational definition of relevance is rooted in visual search theory, the extent to which filler design components (e.g., text or image) are perceived as being pertinent to the search tasks. After sorting and regrouping their inputs, we identified 13 texts and 17 images. Four doctoral students examined these results and selected two highly relevant texts (e.g., “Masquerade Show at Rio – A Show in the SKY! What an exotic Carnival with fantasy floats gliding above the crowd to an orchestration of music, dancers and plenty of FUN!”), two generic texts (e.g., “TravelDepot always strives to offer the best price and flight selection for customers like you. Please wait while we are searching for your flights. Thank you very much.”), five high relevant images,¹ and five generic images. The same 15 subjects then evaluated the relevance of these selected text passages and images on five relevance scales (McKinney et al. 2002). That is, each subject evaluated the relevance-level of each image/text by using items such as “Information (images) provided in the filler interface was informative to me” (Cronbach’s $\alpha = .872$). According to the relevance rankings of the images and text, we derived one highly relevant text, one generic text, five highly relevant images, and five generic images. As we show in Table C1, our subjects noted significant differences on their perceived relevance between relevant and generic images and text.

Based on motion effect theory, image motion was operationalized as a rapidly changing image slideshow representing the illusion of movement (ChanLin 2000). Images were classified into two experimental conditions: moving and static. We fixed the waiting time to 16 seconds (see footnote 3 in the paper) and created five different filler interfaces. For example, in the one-image-in-sixteen-seconds condition (static image), only one image appeared during the 16-second wait period. In the five-images-in-sixteen-seconds condition, five different images appeared sequentially during the 16-second wait period. The five highly relevant images identified earlier by these subjects were used in these interface designs. The same 15 subjects assessed image motion for each one of these five filler interface conditions using two perceived image motion items (e.g., “I feel that the image showing in a filler interface is in motion”) (Cronbach’s $\alpha = .754$). The results of the ANOVA test indicated that subjects perceived significant differences in image motion across the five screen manipulations. A *post hoc* test (see Table C2) also indicated significant differences between all conditions, except between the four images in 16 seconds and 5 images in 16 seconds condition (Tukey HSD: mean difference = -.05, SE = .17, $p > .05$). We also performed another ANOVA test with less relevant images and found the same results. From these results, we selected the one-image-in-sixteen-seconds condition as the static condition and the four-images-in-sixteen-seconds condition as the motion condition to test the effect of image motion on online wait perceptions.

Table C1. Pretest of Study 3: Descriptive Statistics of “Perceived Relevance” for Relevant Versus Generic Images and Text Conditions

	Relevance	Description	Mean	S.D.	F-test	DF	Sig.
Text	Relevant	Las Vegas hotel & famous show information	5.57	0.503	333.057	(1,28)	P<0.001
	Generic	Travel site motto	3.42	0.402			
Image	Relevant	Main strip hotels and recent shows in Las Vegas	5.22	0.600	1140.837	(1,148)	P<0.001
	Generic	Flight attendance, meal, cabin	2.44	0.405			

*Five perceived relevance items were used to calculate mean and standard deviation. A seven-point Likert-type scale was used to measure the items (1 = Strongly disagree... 7 = strongly agree)

¹We need five high and low relevant images to design filler interfaces and investigate the effect of static versus moving images.

Table C2. Pretest of Study 3: Descriptive Statistics and Comparisons of “Perceived Image Motion” for alternatives of Image Motion

Filler Interface	(J) Filler Interface	Mean Difference (I – J)	Sig.
1 (Mean = 1.800, SD = .455) One image was shown during 16 seconds	2 (Mean = 3.125)	-1.325	.000
	3 (Mean = 4.143)	-2.343	.000
	4 (Mean = 5.033)	-3.233	.000
	5 (Mean = 4.800)	-3.000	.000
2 (Mean = 3.125, SD = .341) Two images in sixteen seconds Image changes every 8 seconds	1 (Mean = 1.800)	1.325	.000
	3 (Mean = 4.143)	-1.018	.000
	4 (Mean = 5.033)	-1.908	.000
	5 (Mean = 4.800)	-1.675	.000
3 (Mean = 4.143, SD = .663) Three images in sixteen seconds Image changes every 5.3 seconds	1 (Mean = 1.800)	2.343	.000
	2 (Mean = 3.125)	1.018	.000
	4 (Mean = 5.033)	-0.890	.001
	5 (Mean = 4.800)	-0.657	.003
4 (Mean = 5.033, SD =.611) Four images in sixteen seconds Image changes every 4 seconds	1 (Mean = 1.800)	3.233	.000
	2 (Mean = 3.125)	1.908	.000
	3 (Mean = 4.143)	0.890	.001
	5 (Mean = 4.800)	0.233	.999
5 (Mean = 4.800, SD = .592) Five images in sixteen seconds Image changes every 3.2 seconds	1 (Mean = 1.800)	3.000	.000
	2 (Mean = 3.125)	1.675	.000
	3 (Mean = 4.143)	0.657	.003
	4 (Mean = 5.033)	-0.233	.999

*Two perceived image motion items were used to calculate mean and standard deviation. A seven-point Likert-type scale was used to measure the items (1 = Strongly disagree, 7 = strongly agree)

Dependent Variables

We used the same measures from Study 1 to assess temporal dissociation and focused immersion, and included yet another variable, heightened enjoyment. As discussed in the hypotheses section, in addition to focused immersion and temporal dissociation, users may also perceive enjoyment when they see interface design objects that provide informational and visual support for completing their tasks or moving objects (Hong et al. 2005). Heightened enjoyment was measured using four items from Agarwal and Karahanna (2000) (see Appendix C). An exploratory study with 38 business school students who have used online travel sites was conducted for these dependent variables. All measures showed appropriate levels of convergent and discriminant validity (Eigenvalue for the three constructs were all greater than 1; all factor loading scores were greater than 0.728; and each item grouped well with its own construct). Cronbach’s alpha values were all greater than 0.929 indicating appropriate reliability.

References

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Appendix D

Path Coefficient and Model Fit Comparisons

DV		IV	AA-PWT	CA-PWT	AA-UI	CA-UI	PWT-UI
PWT	←	TD	-.125	-.099	-.126	-.125	-.123
PWT	←	HE	-.374	-.347	-.374	-.374	-.372
PWT	←	FI	-.388	-.442	-.388	-.388	-.385
AA	←	PWT	-.385	-.351	-.389	-.372	-.370
AA	←	HE	.401	.432	.423	.417	.420
CA	←	PWT	-.453	-.440	-.434	-.436	-.446
CA	←	AA	.320	.343	.356	.345	.333
CA	←	HE	-.049	-.057	-.070	-.081	-.055
UI	←	CA	.369	.369	.335	.392	.963
UI	←	AA	.385	.387	.819	.646	.892

*Bold represents significant path coefficients at $p < 0.05$.

Model	CMIN	DF	P	CMIN/DF	GFI	AGFI	NFI	CFI	RMSEA
AA-PWT	771.940	323	.000	2.390	.861	.826	.938	.963	.063
CA-PWT	745.083	324	.000	2.300	.864	.830	.940	.965	.061
AA-UI	730.576	323	.000	2.262	.867	.832	.941	.966	.060
CA-UI	737.470	324	.000	2.276	.866	.832	.941	.966	.060
PWT-UI	745.394	325	.000	2.294	.864	.830	.940	.965	.060

Appendix E

Summary of Practices for Wait Management

Context	Best Practices	Source
Wait online	A macro will perform a Wait for Web Page in Netscape 7.1 by watching an area on the browser's window that changes color when a Web page is loading and then wait for that color to return to normal.	Netscape
Wait page	A few articles mention about a simple "Please Wait ..." page or how to program a component (e.g., a progress bar) to show the percentage of completion or progress of the page loading.	MSDN (Microsoft Development Network)
Wait page	Show a simple wait message on a wait page.	ASP.NET WaitPage Framework
Wait message	Selected content such as product information and announcements is provided during waiting time of an Internet session. In one implementation, the process implemented by the waiting time message program of the invention involves monitoring a user node to identify a web site access request, accessing a previously stored message set, selecting a message from the message set and displaying or playing back the selected message. The message set and particular messages may be selected based on user information (e.g., demographic, psychographic, or product preference information), information regarding the expected waiting time or other information. Messages are thereby provided during waiting time that would otherwise be essentially wasted from the perspective of an ordinary Internet user.	US Patent 5,996,007 – Method for Providing Selected Content during Waiting Time of an Internet Session
Wait display	In a method of displaying advertising and communicating computer operation during a wait period, a plurality of images is displayed during the wait period in a predetermined sequence as part of an animation that indicates that the wait period is proceeding. Advertising information is integrated with the plurality of images.	US Patent 6,304,852 – Method of Communicating Computer Operation during a Wait Period
Wait display	Traffic light countdown, crosswalk countdown, crosswalk animation	Multiple cities in multiple countries
Wait display	It keeps the user informed during the upload process. While uploading files the user is kept in the know with several indicators, from the percentage of the file that has been uploaded to the factors that may dictate the speed of the upload. Even though the user is waiting, a feeling of accomplishment can be felt when the file upload is in the process of completion.	VirusTotal Web site
Wait display	They present how much time is left before the advertisement is over – reducing frustration produced by waiting for ads and giving the user an understanding of the time frame left before they can see what they came for.	Hulu Web site, ESPN Web site
Wait page	When users upload videos and photos to their Facebook, they are given a status window in a new window. This status window shows an image caption which shows which photo or video is currently being uploaded. As the thumbnails of your images flicker before your eyes you see progress being made. In addition there is a text notification section which tells your user what is going on. This text information allows the user to understand the process and see progress be made as well. Finally, there is a status bar. Just as we see when loading other applications this bar moves farther to the left the closer we are to being done. All of the indicators provided by Facebook are developed to inform users what is going on during their wait to help provide a better user experience.	Facebook
Wait page	Discuss how to use busy indicator, working indicator, system messages, progress indicator, static wait cursors, animated cursors, and wait animations at three different wait situations (levels, lengths) – perceptual, dialog, and cognitive.	SAP Design Guide – Waiting at the Computer: Busy Indicators and System Feedback
Wait design	Provide information on screens to create a more relaxing and inviting environment which will decrease perceived wait times. Show helpful reminders, facility news, and industry information to keep your audience entertained and informed while they wait. Decrease the perceived wait times of your clients by highlighting your products and services while they wait. Show specials, seasonal information, or helpful reminders that keep your communication up-to-date, helpful, and relevant to the audience.	RoninCast – Wireless Ronin Technologies
Wait design	CastOven and HappyPrinter are two examples that exploiting waiting time. They use video, light, and background music to make waiting time to entertain and augment the experience.	CastOven and HappyPrinter

Appendix F

Summary and Descriptions of Waiting Screens

Site	Background Color	Logo	Image	Text	Image Motion	Position
11 travel booking sites	Blue – 6 White – 2 Red – 1 Grey – 1 Green – 1	Yes – 11 (small and medium size)	Yes – 6 (all irrelevant) No – 5	Yes – 11 (all irrelevant)	Yes – 10 (different varieties) No – 1	Middle and top-middle – 9 Whole page – 1 Top-left – 1

Site	Background Color	Logo	Image	Text	Image Motion	Position
cheapOair.com	White	Yes (medium size)	No	Irrelevant (flight information, about flight database)	Traditional progress bar	In the middle (1/3 size)
CheapTickets.com	Red	Yes (small)	Yes (irrelevant)/ No (a large circle with “No Booking Fee”)	Irrelevant (slogan)	Animated circles moving across as the progress bar	Top middle (1/3 size)
SmartFares.com	Dodger Blue	Yes (small)	Yes(irrelevant)/ No (banner ad)	Irrelevant (flight information, dare to compare, banner ad)	Blinking dots inside a shape of a rectangle	Top middle (1/4 size)
Hotwire.com	Grey	Yes (in the shaded background)	Yes(irrelevant) (in the shaded background)	Irrelevant (flight information/in the shaded background) (Updating ...)	Icon-changing (bed, flight, cruise) and dot-moving (after the word “Updating”)	In the middle (very small)
CheapAir.com	Royal Blue	Yes (small)	No	Irrelevant (please wait, etc.)	Diamonds change colors across as the progress bar and texts change	In the middle within an odd shape (1/3 size)
Expedia.com	White	Yes (medium)	Yes (irrelevant)/ No (random ad such as Yosemite Park, Puerto Villarta, Travel protection plan)/(slogan)	Irrelevant (flight information, slogan in a box)	Circles moving across as the progress bar	Top and middle (1/3 size)
Orbitz.com	Blue	Yes (small)	No (a popup ad came up)	Irrelevant (slogan in a big box)	Three circles moving across as the progress bar	Top and middle (1/3 size)

Table F2. Descriptions of Waiting Screens of Eleven Travel Sites (Continued)

Site	Background Color	Logo	Image	Text	Image Motion	Position
Travelocity.com	Dark Dodger Blue	Yes (small at the right-bottom)	Yes (Irrelevant, random ad – Colorado, slogan)	Irrelevant (searching, add a hotel ..., Did you know ...)	No	Top middle (1/3 size)
Priceline.com	Deep Sky Blue	Yes (medium)	Yes (dynamic, irrelevant, commercial guy)	Irrelevant (flight information, slogan, fine print)	Circles moving across as the progress bar	Top and middle (1/3 size)
Tripadvisor.com	Dark Pale Green	Yes (immediate regular screen)	No	Irrelevant (flight information, searching, etc.)	Show some results first and animation on top (airline logos, airplanes)	Whole page
Lowestfare.com	Dark Blue	Yes (medium)	Yes (irrelevant, an airplane drawing)	Irrelevant (searching, flight + hotel saving, fine print)	Moving arrow across circles as the progress bar	Top left (1/3 size)

Appendix G

Comparison of Best Practices, Current Practices, and Filler Interface Guidelines from Our Findings

Best Practices – Recommendations from Previous Literature	Current Practices – Observations	Our Findings – Implications and Guidelines
<p><i>Provide a filler screen while users wait</i></p> <p>No specific best practices found with respect to providing a filler screen while users wait in the online environment. – No recommendations There are some best practices for managing waiting time in a physical environment.</p> <ol style="list-style-type: none"> 1. RoninCast: Wireless Ronin Technologies – Providing information on TV screens to create a more relaxing and inviting environment which will decrease perceived wait times. 2. CastOven and HappyPrinter – Using video, light, and background music to entertain users during waiting time and augment their experience. 	<p>No clear guideline for the use of a filler screen – No uniform use of a filler screen during users' wait.</p> <ol style="list-style-type: none"> 1. Hulu Web site and ESPN Web site – No new "wait page" is displayed. They present how much time is left before the advertisement is over on the existing page. 2. Facebook – When users upload videos and photos to their Facebook, they are given a "status window" in a new window. 3. Numerous major travel Web sites – Displaying a "wait page" with a variety of design. 4. MSDN (Microsoft Development Network) – A few articles mention about a simple "Please Wait ..." page. 	<p>Our findings indicate that providing a filler screen while users wait for their requested results is significantly effective than not displaying a filler screen with respect to reducing perceived waiting time.</p> <p>→ Web sites or user interface designers should implement a filler screen whenever an unavoidable wait situation occurs.</p>
<p><i>Design a filler screen with text and/or image</i></p> <ol style="list-style-type: none"> 1. Shneiderman and Plaisant (2010), <i>Designing the User Interface: Strategies for Effective Human-Computer Interaction</i>, and Apple Computer Inc. (2008), "Apple Human Interface Guidelines" – Designing user interface in general where general discussions and suggestions are provided and most of them are neither specific to filler screen design nor specific to various element designs on a filler screen. 2. US Patent 6,304,852: <i>Method of Communicating Computer Operation During a Wait Period</i> – In a method of displaying advertising and communicating computer operation during a wait period, a plurality of images is displayed during the wait period in a predetermined sequence as part of an animation that indicates that the wait period is proceeding. Advertising information is integrated with the plurality of images. 	<p>Almost all major travel Web sites display a variation of filler screen while processing users' request. These Web sites adopt different content and design on their filler screen; however, these filler screens on the market appear to be designed largely based on designers' introspection and intuition, leading to irregular patterns and implementation styles (e.g., images and text, color, animation, etc.).</p> <ol style="list-style-type: none"> 1. Orbitz.com – Showing text message (slogan) but no image. 2. Travelocity.com – Showing text message (e.g., searching, add a hotel ..., Did you know ...) and a random image (e.g., a place, a slogan). 3. Expedia.com – Showing text message (e.g., flight information, slogan in a box) and a random ad image (e.g., Yosemite Park, Puerto Villarta, travel protection plan). 4. Hotwire.com – Showing text message (flight information in the shaded background) and a random image. 	<p>Our findings suggest that displaying visual elements (such as text or image) on a filler interface works significantly better than using no such design elements with respect to reducing perceived waiting time.</p> <p>→ Web sites or user interface designers should consider adding basic visual cues (text or image) on their filler interfaces in order to manipulate customers' time perceptions.</p>

Best Practices – Recommendations from Previous Literature	Current Practices – Observations	Our Findings – Implications and Guidelines
<p>Design a filler screen with relevant text and/or image</p> <p>1. US Patent 5,996,007: <i>Method for Providing Selected Content during Waiting Time of an Internet Session</i> – Selected content such as product information and announcements is provided during waiting time of an Internet session. In one implementation, the process implemented by the waiting time message program of the invention involves monitoring a user node to identify a web site access request, accessing a previously stored message set, selecting a message from the message set and displaying or playing back the selected message. The message set and particular messages may be selected based on user information (e.g., demographic, psychographic, or product preference information), information regarding the expected waiting time or other information.</p>	<p>Almost all major travel Web sites adopt different some type of text and/or image on their filler screen; however, these texts and images on filler screens are not relevant to users' tasks and purposes.</p> <ol style="list-style-type: none"> 1. cheapOair.com – Showing generic (irrelevant) text message (e.g., about flight database) but no image. 2. CheapTickets.com – Showing generic (irrelevant) text message (slogan) and generic (irrelevant) image (a large circle with "No Booking Fee"). 3. Lowestfare.com – Showing generic (irrelevant) text message (e.g., searching, flight + hotel saving, fine print) and generic (irrelevant) image (an airplane drawing). 4. CheapAir.com – Showing generic (irrelevant) text message (e.g., please wait, etc.) but no image. 	<p>Our findings provide strong evidence for inclusion of task-relevant information on filler interfaces. Relevant visual cues (text and image) were shown to be significantly more effective than generic visual cues with respect to reducing perceived waiting time.</p> <p>→ Web sites or user interface designers should use task-relevant visual cues (text and image) whenever possible on their filler interfaces to assist users' tasks/purposes and usage contexts such as travel destinations (e.g., for airfare booking), products and services (e.g., for keyword search), features and functions (e.g., for software installation), special offers and promotions (e.g., for music download), and other wait situations.</p>
<p>Design a filler screen with multiple and dynamically changing images</p> <p>No specific best practices found with respect to providing moving images on a filler screen while users wait in the online environment – No recommendations.</p> <p>There are some best practices for managing waiting time with busy indicators and system feedback.</p> <p>1. SAP Design Guide: <i>Waiting at the Computer: Busy Indicators and System Feedback</i> – Discuss how to use busy indicator, working indicator, system messages, progress indicator, static wait cursors, animated cursors, and wait animations at three different wait situations (levels, lengths) – perceptual, dialog, and cognitive.</p>	<p>No clear guideline for the use of multiple and dynamically changing images on a filler screen – No uniform use.</p> <ol style="list-style-type: none"> 1. Netscape – A macro will perform a Wait for Web Page in Netscape 7.1 by watching an area on the browser's window that changes color when a Web page is loading and then wait for that color to return to normal. 2. Priceline.com – Showing texts (e.g., flight information, slogan, fine print) and dynamic images (e.g., a series of images of Priceline "commercial guy"). 	<p>Our findings suggest that showing moving images on a filler interface is significantly better than using only a static image with respect to reducing perceived waiting time.</p> <p>→ Web sites or user interface designers should display multiple and dynamically changing images instead of just one static image.</p>

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