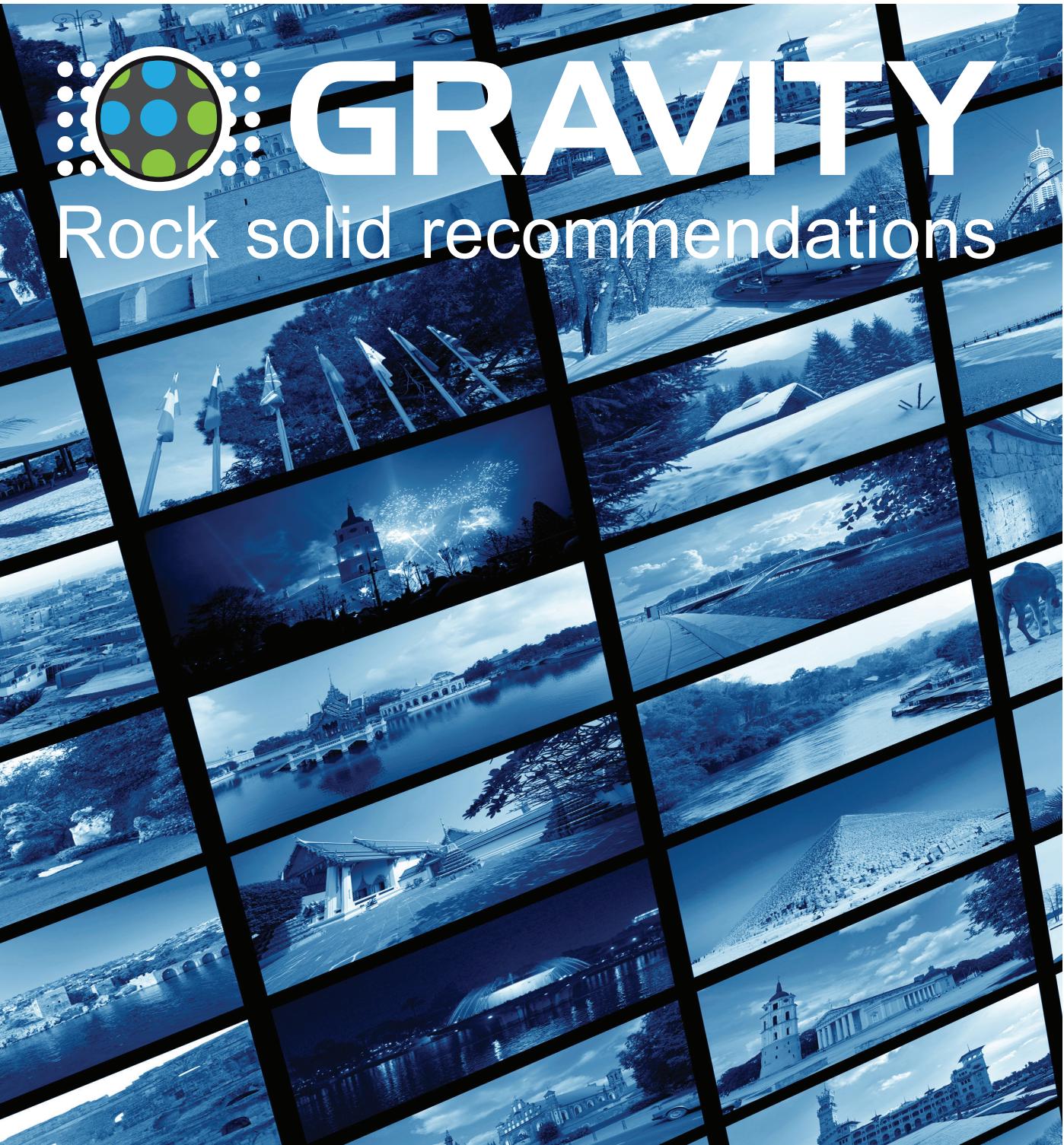




GRAVITY

Rock solid recommendations



PERSONALIZE THE CLASSIFIED EXPERIENCE

Turn real-time big data into
personalized digital experiences

White Paper

June 24, 2013

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INTRODUCTION

Throughout the past decade, we have witnessed a tremendous improvement in the sophistication and performance of recommendation platforms. Initially aimed at helping customers find the relevant content more easily, deploying recommendation systems is rapidly becoming a best practice for online businesses aiming to boost visitor engagement and increase Key Performance Indicators like Click-Through Rate, Page Views, Ad Replies and Time Spent on Site. In this regard, solving the serendipity¹ challenge by recommendations may also contribute to user satisfaction. This white paper distills a large part of the experience that Gravity R&D has gathered over the years in several projects in the online classified media industry.

For maximum efficiency, several "input factors" should be optimal on the online classified business' side. The catalog size and multi-screen compatibility are important prerequisites for quality recommendations. Once the right input factors are in place, a key component of the recommendation engine is processing and crunching the right data from the website. In most classified media projects, Gravity R&D makes use of Ad Views and Ad Replies (contact request) as the basic information source for user profiling in live classified ads.

A project's success is also determined by the amount of freedom the marketing team has in setting up promotions and fine-tuning the rules that impact recommendations. Gravity's solution is quite flexible in this regard.

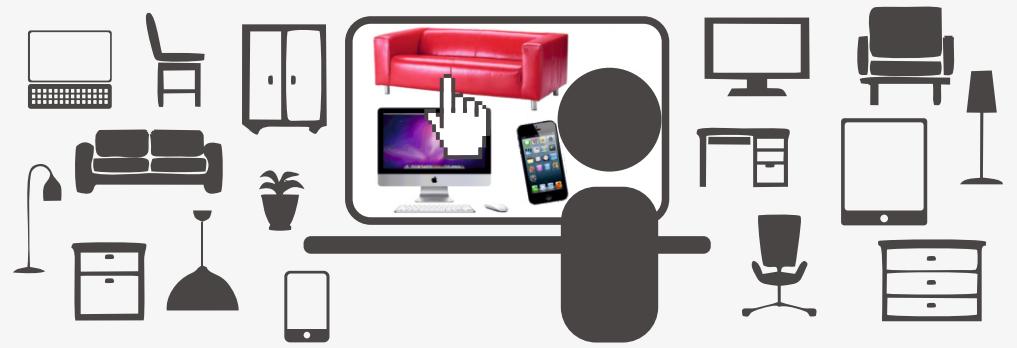
In this white paper, we provide several real-life customer examples along with exact figures that Gravity has achieved. Finally, we provide some lessons learnt along the way and a list of solutions for the different lifecycle phases of online classified media businesses.

¹**Serendipity** means a "happy accident" or "pleasant surprise"; a fortunate mistake. Specifically, the accident of finding something good or useful while not specifically searching for it. (from Wikipedia)

THE UNIVERSAL NEED FOR PERSONALIZATION

Most classified websites are designed to satisfy the needs of the average user. Still, each visitor has his or her own desires, interests, needs and tastes. There may be millions of ads to show, but a visitor is only interested in looking at 10. They will end up buying only 1. There is very little time to help them achieve this. The site search box isn't a satisfactory solution, as it is hard to search by the quality and state of the product, whether it is modern or "old-timer", and so on.

THE CHALLENGE 1,000,000+ ads, 1000s of different visitor dreams, but only one screen.



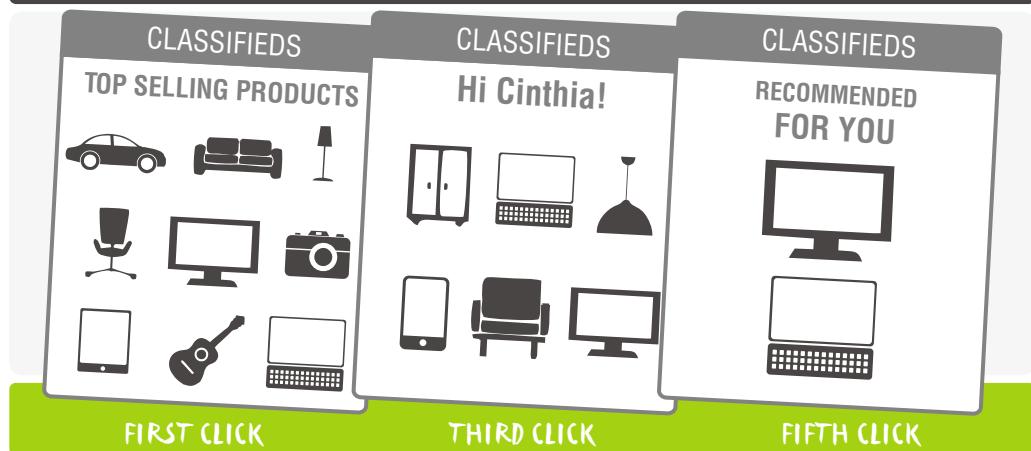
Do you have the same ads for everyone?

Personalization (also called personalized marketing and sometimes one-to-one marketing) has been around for the last 15 years, and is an extreme form of product differentiation. Whereas product differentiation means to differentiate a product from competing ones, personalization delivers individual product offering for each customer. Bottom line: personalization helps customers choose, by organizing and prioritizing information based on the individual's tastes.

Personalized marketing campaigns demand a lot of work. Marketers must have a database sliced and diced in relevant ways, and come up with the right incentives and messages for each group. However, the payoff can be huge, with personalized campaigns outperforming mass-marketing in engaging customers. Still, the vast majority of services offer no personalized content on their company website. A major reason marketers give for avoiding personalized marketing is a lack of useful tools for implementing it. That holds even more so in terms of providing on-the-fly, or real-time personalization.

If a website can track a customer's interests and make suggestions to display the content that matches their interest very closely, this not only makes a classified website more useful, but will also ensure that its users return time and time again.

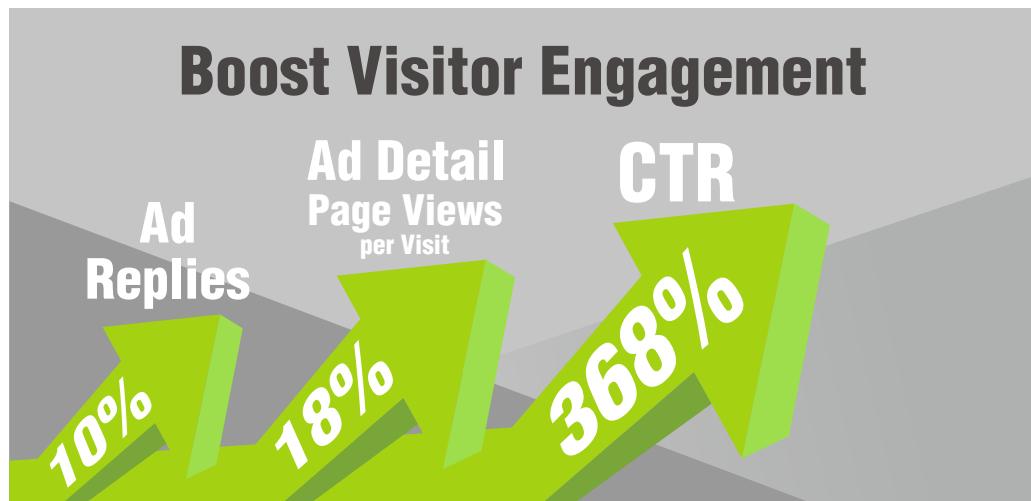
RECOMMENDATIONS GET SMARTER WITH EVERY CLICK



THE PROMISE FOR ONLINE CLASSIFIED MEDIA

Personalized content recommendations boost visitor engagement for all kinds of online businesses, especially for classified media sites. This boost can best be expressed in terms of improvement in Key Performance Indicators (KPIs) such as Click-Through Rate by over 300%, Page Views by 15 to 20% and Ad Replies (or contact requests) by 10%.

Personalized, relevant and interesting ads make it more likely for each visitor to engage with the recommended content and click on them, thus increasing CTR and improving user satisfaction thanks to optimized content discovery. Higher CTR results in more Ad Replies (contact requests) and a higher number of Page Views per visit, especially for Ad Detail pages. Time spent on site will show an increase of 3 to 4%, too.



ABOUT THE PROVIDER OF "ROCK SOLID RECOMMENDATIONS"

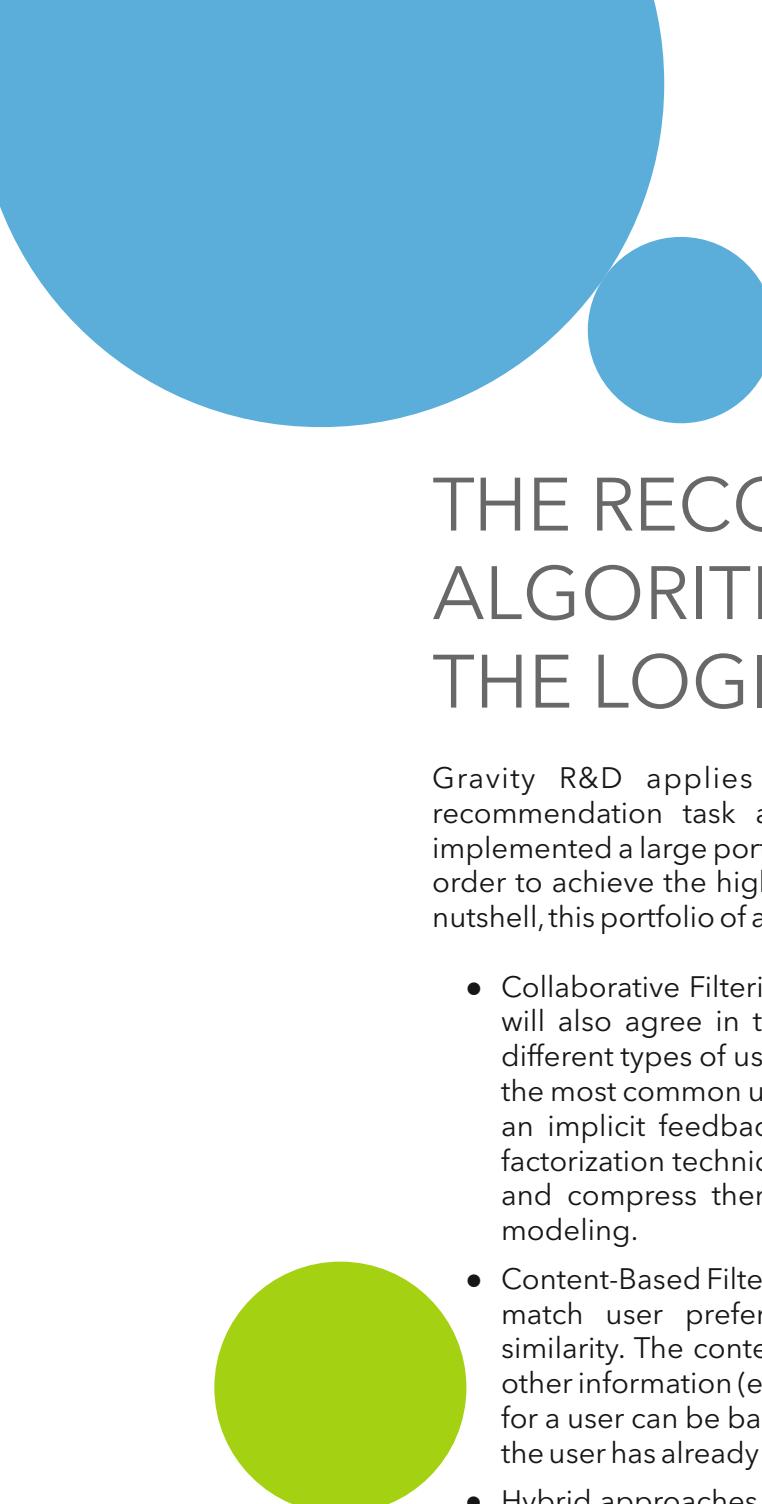
Gravity R&D's core essence is real-time Big Data analytics: its personalization system builds up, and continuously maintains a behavior-based model of user taste profiles, and makes on-the-fly calculations for personalized recommendations for each visitor. Gravity has been developing and marketing this recommendation solution, RECO, since 2007. RECO is a platform that maximizes revenues by personalizing content (ads) for each visitor in every lifecycle stage of both the user and the classified site. The company's experience in big data is combined with the latest technology developments that enables RECO to deliver relevant content in real-time and on any type of screen, be it a mobile phone, tablet, PC, or even a TV screen in the living room.

The team has repeatedly demonstrated its excellence in innovative solutions and Big Data. Gravity's approach to personalization received the 2012 "Show me the Money" innovation award from the International Classified Media Association (ICMA), and the team achieved the highest overall score at the Netflix Prize contest, the most important competition of recommendation algorithms worldwide.

Today, Gravity has a data scientist team of 10, several with PhD degrees. Gravity is the largest third-party recommendation engine provider in the world, serving over 100 million individually tailored recommendations per day in demanding environments. The company has over 50 customers on 3 continents, such as the

- Schibsted Classified Media Group, which is number 2 worldwide in online classifieds, right behind Craigslist.org (and ahead of Ebay.com),
- RCI, the largest timeshare vacation exchange network worldwide,
- CenturyLink, the 3rd largest telecommunications company in the United States after AT&T and Verizon.

Here are some further case studies that demonstrate Gravity R&D's value to generating additional revenues for its clients.



THE RECOMMENDATION ALGORITHMS AND THE LOGIC BEHIND

Gravity R&D applies specialized, fine-tuned algorithms for each recommendation task and scenario. The company has developed and implemented a large portfolio of algorithms and combines various elements in order to achieve the highest recommendation performance and quality. In a nutshell, this portfolio of algorithms consists of the following methods:

- Collaborative Filtering (CF) assumes that users, who agreed in the past, will also agree in the future. There are various methods for handling different types of user feedback. For the online classified media projects, the most common user feedback is the Ad Views and Ad Replies, which is an implicit feedback on user preference. The solution applies matrix factorization techniques that are able to scale with a vast amount of data and compress them into easy-to-manage sizes for user and content modeling.
- Content-Based Filtering (CBF) makes use of user and content metadata to match user preferences with recommendable content, based on similarity. The content similarities are based only on their metadata; no other information (e.g. viewing history) is used. Content recommendation for a user can be based on pieces of content that are similar to those that the user has already viewed.
- Hybrid approaches combine CF and CBF approaches to get the best of both worlds.

In the next chapter, we will describe the results of three online classified media pilots. Gravity used content-based filtering in the case of newly uploaded ads based on their metadata information. This builds up their model and makes them available for recommendations, even if these ads haven't yet experienced any user interaction. As soon as there is enough user interaction on these certain ads, we apply collaborative filtering methods, where similarity definition relies both on user sessions and full user histories. This collaborative approach eliminates such common issues as mistyping, wrong categorization, language differences. Gravity opted for this solution because finding the clickstream pattern of users with similar needs helped to find and display the right advertisements.

PERSONALIZATION CASE STUDIES ON CLASSIFIED MEDIA SITES

Gravity R&D has been working with Schibsted classified site Jofogas.hu since 2011, with the purpose of boosting user engagement, increasing Click-Through Rate (CTR) and Page Views per Entering Visit (PV/EV). The results from this cooperation paved the way for jointly winning the ICMA Innovation Award in 2012.

Recently, Gravity R&D has been engaged in pilot experiments with three other online classified media sites around the world, each of them taking 3 to 4 months. For the sake of anonymity, we shall call them "A.com", "B.com" and "C.com". A.com is a site with over 9 million monthly unique visitors. B.com and C.com are smaller sites, with about 3 million monthly unique visitors, on average.

Throughout these pilots, Gravity integrated a recommendation system and conducted exhaustive A/B testing for fine-tuning purposes. The goal in each case was to personalize the ads that were being shown to the visitors on the classified site. As demonstrated below, RECO achieved a considerable boost in user engagement.

- The number of Ad Detail Page Views per Visit increased by 8% to 18%. The exact number depends on whether Gravity had any in-house developed recommendation engine in place to compete with.
 - B.com has been operating and maintaining an in-house developed recommendation engine since several years. Gravity managed to surpass this in-house solution by 8%.
 - A.com and C.com didn't have such an in-house developed recommendation system in place, and Gravity was able to increase the number of Ad Detail Page Views per Visit by 17% to 18%.
 - A.com also experimented with a comparison between Gravity's recommendation algorithm and a placement with randomly selected ads. The difference in effectiveness was comparable to the situation where no recommendation engine was in place at all: Gravity reached the same increase in Ad Detail Page Views, 17% to 18%.
- The number of Total Page Views per Visit increased by 3% on A.com, 2.5% on B.com and 2% on C.com.
- Click-through rates (CTRs) achieved on recommendations:
 - CTR on Ad Detail Page: 16%
 - CTR on Result Page: 12%
 - CTR on Zero Result Page: 14%
 - CTR on After Ad Reply box: 16%
- The number of contact requests (Ad Replies) also showed an increase of 7% to 15% in the group getting recommendations through Gravity.
- Last but not least, time spent on site increased by 3.5%.

Key Performance Indicators		A.com	B.com	C.com
CTR on	Ad Detail Page	16%	8%	14%
	Result Page	12%	N/A	7%
	After Ad Reply box	N/A	16%	16%
	Zero Results Page	14%	N/A	N/A
Increase in	CTR on Ad Detail Page	368%	235%	N/A
	CTR on After Ad Reply box	N/A	320%	N/A
	Ad Detail PV/EV	16% - 18%	8%	18%
	Total PV/EV	3%	2.5% - 3%	1% - 1.5%
	Time Spent on Site	3%	N/A	N/A
	Ad Replies	Total	N/A	7%
		"jobs" only	N/A	15%
Proportion of Ad Replies that go through Gravity recommendation boxes		N/A	8%	15%

TOP LESSONS LEARNED

Along the way of having tested personalization on online classified media sites, we learned the following key lessons.

Ad Replies

- We found that the more replies an advertisement has, the bigger Gravity's contribution is for increasing Ad Reply rate, especially so in „job”, „computer accessories” and „mobile gadgets” categories.
- The more Ad Replies a person makes a day over a certain limit (e.g. 10 per day), the less effect Gravity recommendations have on such individuals. After having cut the Ad Reply numbers over 10 per day per person (in order to cut off “extremes”), the Ad Reply curve smoothed and the fluctuation seemed to disappear. In other words: recommendations do not have any effect on people who want to view all items (ads) in a product category.

Placement

User response is highly affected by the visual display of the recommendations. Gravity is regularly asked where and in what form the recommendation box should be located on a specific site. Although there is no universal answer for this question, some guidelines were drawn up for the effective placement of recommendations:

- The recommendation box should be above the fold, that is, visible without scrolling. Experience shows that recommendations generate far more clicks if they are immediately in front of the users' eyes. In some cases like multi-page listings, a bottom-placed recommendation box can also be effective.
- Recommendation boxes on the Ad Detail Page: placement on the right side usually works better (18% CTR), compared to placement at the bottom of the page (12% CTR).
- Although a recommendation box on the Result Page has a relatively slight effect on the total increase of Page Views per Visit (P/V), it had a largely positive effect on increasing the number of Ad Replies.
- The offers should ideally be colorful, with pictures and images to attract more attention than would simple plain text. By doubling the size of the images on one of our online auction reference site, Vatera.hu, the number of clicks on recommendations increased by nearly 45%.
- A recommendation box with randomly selected ads has no effect on user engagement, and it can even be counterproductive, deteriorating the user experience. This was demonstrated by A.com, where an experiment was made, comparing a placement with Gravity's recommendation algorithm and the same placement with arbitrarily selected ads. Gravity reached the same increase in Ad Detail Page Views, 17% to 18%.
- Recommendation boxes should fit into the style of other page elements. A recommendation is a self-promoting tool, and if it stands apart from the theme of the page, it could easily lead to banner blindness. The user should be advised that they are being shown something special, so in the heading of the recommendation box we suggest to use a recommendation explanation like "Personal Offer", "Recommendations for You", etc.

Controlled Experiments with A/B or Multivariate Test

We found that in most cases, it is hard to assess the value of new ideas, especially if we want to optimize for customer lifetime value, and not immediate short-term revenue. Features are built because teams believe they are useful, however, most experiments show that 60 to 90% of these features fail to move the metrics they were designed to improve. It is highly recommendable to avoid the temptation to try and build optimal features through extensive planning without early testing of ideas with controlled experiments. An Econsultancy report from 2013 indicated that companies are lagging behind in such experiments, with more than half (57%) of companies surveyed not running any A/B or multivariate tests.

If we are to do such experiments, it is best to try more variants. As a general rule of thumb, if we triple the experiment rate, we will probably triple our success (and failure) rate as well. From the book of Mike Moran, *Do it Wrong Quickly*: "If you have to kiss a lot of frogs to find a prince, find more frogs and kiss them faster and faster".

The web provides an unprecedented opportunity to accelerate innovation by evaluating ideas quickly and accurately. Whether for front-end user-interface changes, or back-end recommendation systems, online controlled experiments are now utilized to make data-driven decisions. A/B tests provide the best scientific way to prove causal relationships between changes and their influence on user-observable behavior. Our experience indicates that significant learning and return-on-investment (ROI) are seen when development teams listen to their customers, not to the Highest Paid Person's Opinion (HiPPO).

Explanations DO help

Telling users why they are getting a recommendation can play an important role in building credibility and trustworthiness, and it also improves the user experience: explanations can inspire user trust and loyalty, increase satisfaction, and make it quicker and easier for users to make good decisions.

Aim	Definition
Transparency	Explain how the system works
Accountability	Allow users to tell the system it is wrong
Trust	Increase users' confidence in the system
Effectiveness	Help users make good decisions
Persuasiveness	Convince users to try or buy
Efficiency	Help users make decisions faster
Satisfaction	Increase the ease of usability or enjoyment

As indicated above, explanations can serve multiple aims. For example, explanations can provide transparency, exposing the reasoning and data behind a recommendation. This is the case with some of the explanations hosted on Amazon.com, such as "Customers Who Bought This Item Also Bought..."

Alternatively, explanations can be more focused on helping users make decisions (about the content) that they are happy with: effectiveness. An effective explanation may be formulated along the lines of "You might like this piece of content because..." In contrast to the Amazon example above, this explanation does not necessarily describe how the recommendation was selected.

Desktop vs. Mobile Device

Most organizations have a desktop-centric online customer experience focus, but phones and tablets should not be ignored either. More and more visitors use their mobile devices to access classified sites. The number of such visitors will further increase due to the marketing activities that direct users towards this platform. As it was revealed in our experiments, relevant recommendations have an even larger impact on user engagement for mobile users because of the smaller screen size: it improves user experience significantly and makes navigation easier.

Based on an Econsultancy report from 2013, 43% of companies deliver personalized experiences to the desktop, with a further 40% planning to do so in the next 12 months. Only 14% of in-house marketers indicate they are using tablets to deliver personalized experiences, with a similar proportion (13%) personalizing on mobile phones. Around a third don't plan any personalization on mobile devices, while just over half (54%) of companies plan to do so within the next 12 months.

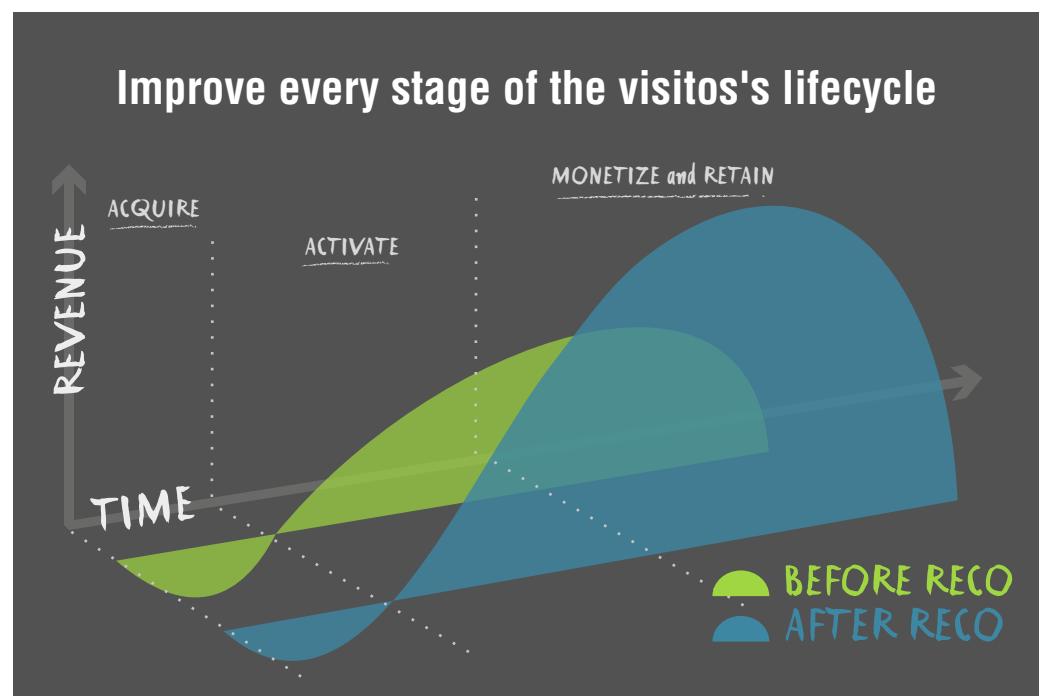
SOLUTIONS ALONG THE LIFECYCLE OF ONLINE CLASSIFIED MEDIA

One can differentiate between three major lifecycle phases of online classified media sites:

Acquire: gaining user base and content portfolio

Activate: boosting buyer-seller interactions and visit frequency

Monetize & Retain: monetizing market leader position



Acquire: Gaining User Base and Content Portfolio

Here we are talking about a classified company that has just been launched. The most crucial challenge in this phase is to attract many buyers and sellers to reach a critical mass of user base and content portfolio. Here are our suggestions for the solutions to implement:

1. Pinpoint those product categories that receive higher level of interactions.
2. Cost optimization for Search Engine Marketing (SEM) with real-time bidding.
3. Generate unlimited number of personalized landing pages in real-time, automatically - the moment a visitor enters the classified site from a search engine.
4. Leverage social engagement that can bring a viral nature to the classified site. Creating and promoting sweepstakes, photo contests and photo caption contests in which the classified visitor are incentivized to invite their friends or create an exciting promotional offer that requires customers to "like" the classified page.

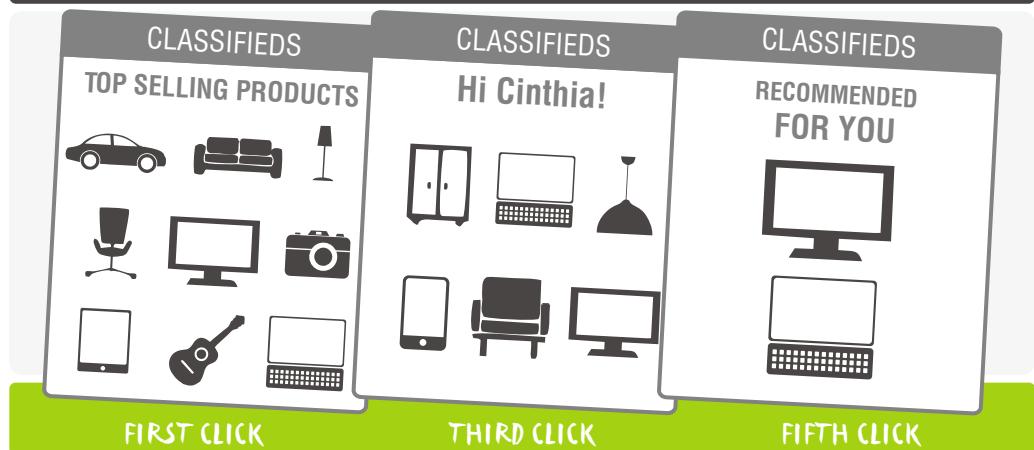
Activate: Increasing Buyer-Seller Interactions and Visit Frequency

In the activation phase, the company that just reached the critical mass of people and content is about to challenge the local classified market leader. However, this is to be done with limited capital (monetization). The major strategic challenge here is to increase the number and frequency of visits and interactions between buyers and sellers (Ad Replies), across all types of different screens. Integrating personalization into the mobile platform of classified sites is an organic and necessary step. Other than the multiscreen approach, here are some further suggestions:

1. On-site personalized recommendations in order to increase the number of page views per visit.
2. Cross-site recommendation for traffic channeling, in the case of a portfolio of other sites. Data is at the heart of an online media company, thus the ability to refer people across a portfolio of sites and keep them in the portfolio with the least possible cost is very important. Also, the media company can sell online advertising across these sites, based on what it knows about its people's interests.

3. Personalized retargeting on 3rd party websites / blogs, in order to re-engage and convert high-intent prospects with personalized banners on sites the classified company advertises on. Many companies suffer from poor results in their retargeting campaigns. The problem is the same as anywhere else on the web: irrelevance and choice overload. In a retargeting message, classified site needs to communicate and engage with a large degree of relevance.

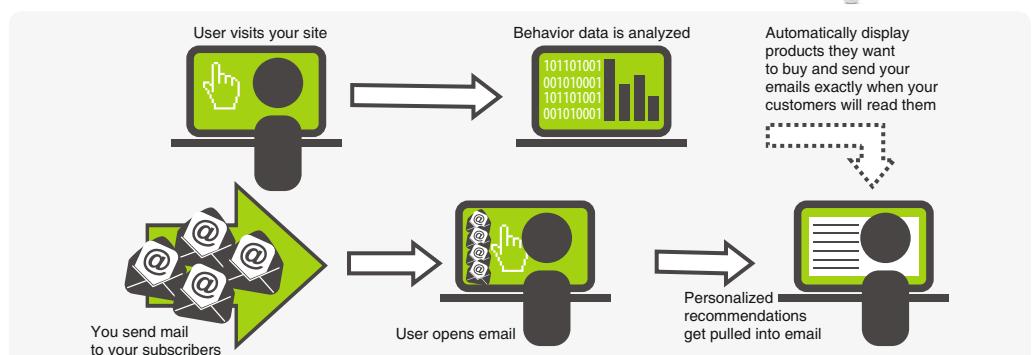
RECOMMENDATIONS GET SMARTER WITH EVERY CLICK



4. Enhanced user experience through personalized user journey. E.g. a person, who is browsing among baby strollers today, can be counted on for further child-related stuff along the growth of the child. Also, if somebody is looking around for used cars today, this person might be interested in car repair service providers in 2 years' time and in homes for sale in 3 to 5 years.
5. Personalized newsletters, transactional emails and alerts

EMAIL PERSONALIZATION

easy integration with:

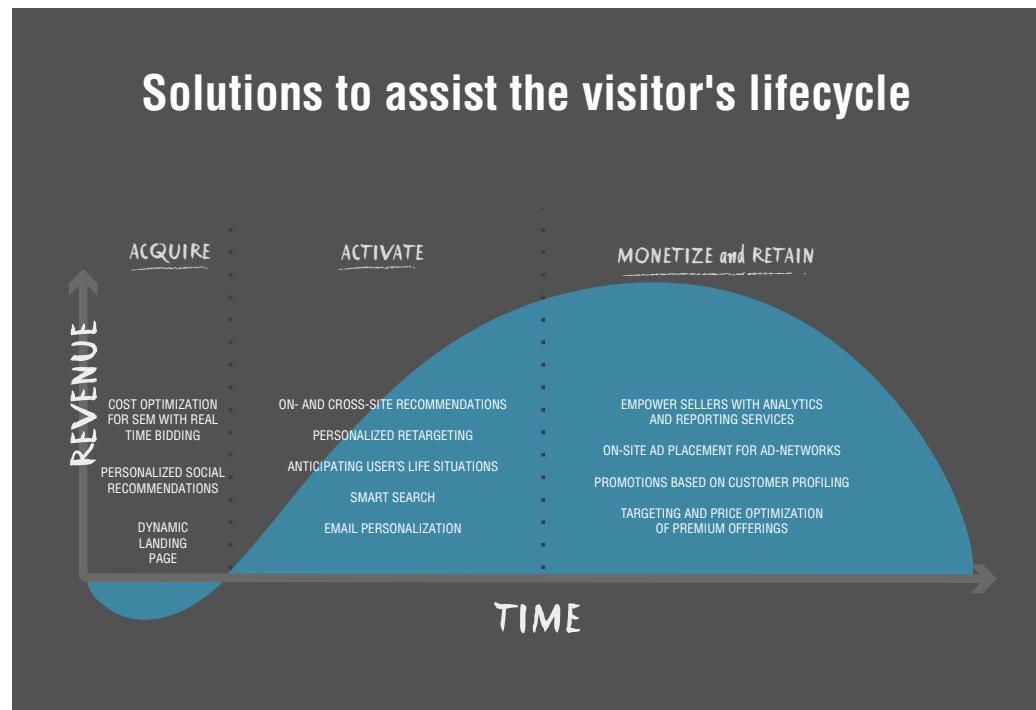


Integrate to your email marketing software, send emails exactly when your customers will read them, with the exact products they want to buy - without involving IT.

Monetize & Retain: Monetizing Market Leader Position

In the monetize and retain phase, it is about a well-established, profitable classified company whose major concern is to monetize its current market leader position as efficiently as possible. The solutions that could be useful to implement are the following:

1. Analytics and reporting services for professional sellers of the classified site (B2C). Empower the sellers by keeping them up to date on how prices are trending in their market, and provide them with a custom chart of the average listing price and available inventory for any sub-regions/cities.
2. Relevant on-site ad placement for ad-networks (partnership with ad-networks). Avoid spam and target captive visitors most likely to be interested in a 3rd party advertisement. This also allows the classified site to ask for a higher Cost per Click (CPC). Target ads to mobile users, geographies and consumer behaviors. As an example, just imagine the financial value of using a personalization platform to arm classified company's sales team with customers' favorite brands, which they then approach as potential advertisers and promotional partners. Also, the classified site can leverage its reach across the online audience of its respective country by developing partnerships with local ad server / ad network providers.
3. Product/service promotions based on customer profiling for optimized offerings. High traffic sites can have a very significant reach. Active tracking and analysis of user behavior enables site owners to build detailed user profiles that can be used for internal processes, but also can be monetized through targeted advertising and retargeting channels.



REFERENCES

Mashable: The Future of Online Classifieds: 5 Ways to Beat Craigslist, Mar 28, 2011; <http://mashable.com/2011/03/28/craigslist-missing-features/>

HBR: Is Your Company Ready for One-to-One Marketing? 1999; <http://hbr.org/1999/01/is-your-company-ready-for-one-to-one-marketing/ar/1>

eMarketer: Personalized Marketing Brings Rewards and Challenges; Jun 2, 2011; <http://www.emarketer.com/Article/Personalized-Marketing-Brings-Rewards-Challenges/1008417>

'Big Data' Can Be Hard to Harness, May 22, 2012; <http://www.emarketer.com/Article/Big-Data-Hard-Harness/1009064>

Wikipedia: Personalized marketing; http://en.wikipedia.org/wiki/Personalized_marketing

Cmswire: The Psychology of Personalization: Needs, Wants and Influence; Aug 3, 2012; <http://www.cmswire.com/cms/customer-experience/the-psychology-of-personalization-needs-wants-and-influence-016790.php>

Publications:

Navia Tintarev, Judith Masthoff: A Survey of Explanations in Recommender Systems, 2007

Mustafa Bilgic: Explanation for Recommender Systems: Satisfaction vs. Promotion, 2004

Econsultancy: The Realities of Online Personalisation, April 2013 <http://econsultancy.com/hu/reports/the-realities-of-online-personalisation-report>

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