

An IC-System to Apply Push Concepts in E-commerce Transactions

Dr. S. Robra-Bissantz, A. Zabel
Department of Information Systems
University of Erlangen-Nuremberg
Lange Gasse 20
90403 Nürnberg
robra | angela.zabel @wiso.uni-erlangen.de

Abstract: A major problem of e-commerce is the high rate of customer initiated abortions of processes. It may be solved by the implementation of a Push System that supports the webshop. One major module of the Push System is the Pushflow Manager that proactively leads customers through their processes by taking over tasks or triggering following activities. Its theoretical background, the Push Concepts, prototype implementation as well as transfer into practical surroundings are presented.

1 Motivation

One problem for enterprises in e-commerce is the one-sided control of processes by customers, according to pull principles. He/she pulls information from the internet, requests offers, specifies his/her desires, compares different options and finally sends an order to initiate the transaction. Both, in a single transaction and in a longer customer relationship, the supplier reacts more than he can act. In particular there are interruptions (“stoppages”) in every single process. At these points the supplier has to wait for the customer’s actions [GaRi01].

If the supplier aligns his e-commerce offer to Push Principles, he has the possibility to overcome stoppages with automated Push Oriented Activities provided by an IC-System (Information and Communication System). These support customers by individual and proactive activities and make it possible for the supplier to take over the control of the e-commerce processes at the same time.

2 Push Concepts in E-commerce

3.1 Definition

In Push Concepts the buying process of customers in e-commerce is seen as a service process, with the customer as active partner. He/she interacts with the service potential of the supplier: the contents and process structure of his website. The crucial idea of Push Activities is the following: The supplier tries to anticipate

the activities of the customer. As soon as he/she is hesitating to fulfill it, he takes over functions of the buyer or at least triggers the buyer to take further steps in the buying process. All actions and triggers are situated and individualized for the needs of one special customer in his situation.

A conceptual meta-framework helps to classify Push Opportunities and to describe starting-points for Push Activities on several levels of the customer relationship [RoWB04]. It comprises of three levels:

- Interaction level: An interaction consists of a single, synchronous communication between buyer and supplier or their IT systems respectively. If the buyer is about to abort an interaction without meeting the interaction's goal (e.g. completing an online order form and sending it to the supplier), a Push Opportunity arises.
- Transaction level: An economic transaction consists basically of the information phase, negotiation phase and settlement phase [Geba96]. These phases can be divided into a number of smaller subphases [FeSi01]. Whenever a phase is completed and the buyer hesitates to initiate the next transaction phase it is called a Push Opportunity on transaction level.
- Relationship level: On this level, Push Approaches do not aim at the completion of transactions that have been already initiated, but at the commencement of new transactions in the Relation Life Cycle [Plin97; Dill88]. The Relation Life Cycle starts with the first contact of a seller with a customer. Push Opportunities arise by the automated perception of promising situations, in which an individual need of the customer may be expected.

3.2 Related Concepts

Stoppages in e-Commerce namely the so called abandoned shopping carts mean a significant problem to e-commerce suppliers. There exist a lot of studies that deal with it [JaSK02; Krau99; PrHa99]. Very often these more practical observations mix up reasons that depend on product and price itself, general problems of e-commerce such as trust deficiencies and different single obstacles in the e-commerce process. As a result, there is almost no research that leads to concepts of how to face stoppages that may be prevented.

In research that alludes to Push Concepts there are approaches that use push mechanisms in Internet communication. Webcasting concepts push information via screen savers or tickers, instead of letting the customer pull information from a website [HoTi98; HaJa99; Eich99]. Concepts of Customer Relationship Management try to anticipate future needs of customers by analysing their individual buying history [Stol00; Ecke00; HeHW00; Haas03]. In traditional marketing Push Concepts that imply a direct and unasked address of customers for selling purposes are well known [Ried98]. But all these approaches neglect the need for integrated and individual concepts, that are strictly based on the customer's needs and moreover help the supplier to overcome stoppages and achieve the control of e-commerce processes.

Other approaches focus the needs of customers in e-Commerce processes. They stress the task to regard transactions as service processes, where the customer may satisfy needs that go well beyond buying products in a man-machine-interaction that comes close to interaction with personal sellers [Palm02; AgVe02; ZhDr02; MDBM01; NoHY01; ChTa04]. Building an integrated concept of how to meet these special needs is hardly part of this research.

3 Push System

3.1 Concept

The control of Push Activities on different Push Levels as well as their release in situation-based and individualized communication is implemented in a Push System [Weis03]. It is realized as an additional component that may run with any webshop. Via specified interfaces the Push System has access to the order database and an extended customer database of the shop system.

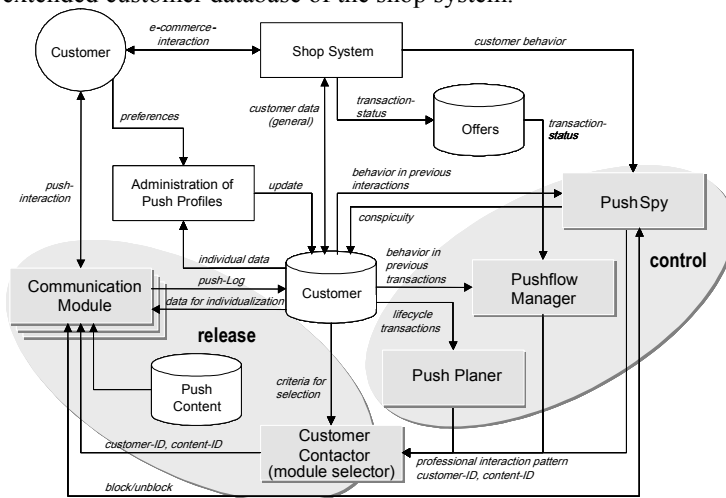


Figure 1: Overview of the Push System

Starting point of all Push Activities is the observation of the customer's interactions with the shop system. In order to identify Push Opportunities and release Push Activities, three control components are used:

- The Push Spy examines the interactions of the customer with the shop system regarding Push Opportunities on interaction level (e.g. repeated use of the search function as indicator for helplessness) [RoZa05],
- The Pushflow Manager is dedicated to the identification of Push Opportunities on transaction level (e.g. delays before adding the product to the shopping cart),

- The Push Planner decides on the use of Push Activities on relationship level (e. g. proposal of a product that meets customer’s requirements).

If the control components identify a Push Opportunity, they will transmit the Push Activity which has to be carried out to the release components. There the Customer Contactor selects a Communication Module. This Communication Module receives the suitable content from the Push Content Repository and realizes the Push Activity in communication with the customer. Push Activities do not intervene in the logic of the shop. They only refer to special pages if necessary.

All components of the Push System possess an administration surface which the supplier can use to customize the system for his special needs, his special shop and his special customers. He can use it to model his transaction process, make the media available, that he wants to use as Communication Modules, enter the exact Push Contents or simulate all settings and parameters.

3.2 Prototype System

In a prototypical implementation the Push System uses Java, JavaServer Pages and PHP to produce dynamic web pages and the database system MySQL. Figure 2 shows the logic of the Push System in UML.

The observation of the customer’s interactions with the shop system is realized by a transfer of every single page request to the Push System. The analysis for Push Opportunities starts with the Push Spy which controls behavioral patterns based on rules. After that, the Pushflow Manager receives the page request and the propositions of the Push Spy for Push Activities. It supervises the transaction progress and decides, whether there are Push Opportunities on transaction level that have to be taken into consideration. With a higher priority on the transaction level, it either decides on its or the Push Activity proposed by the Push Spy.

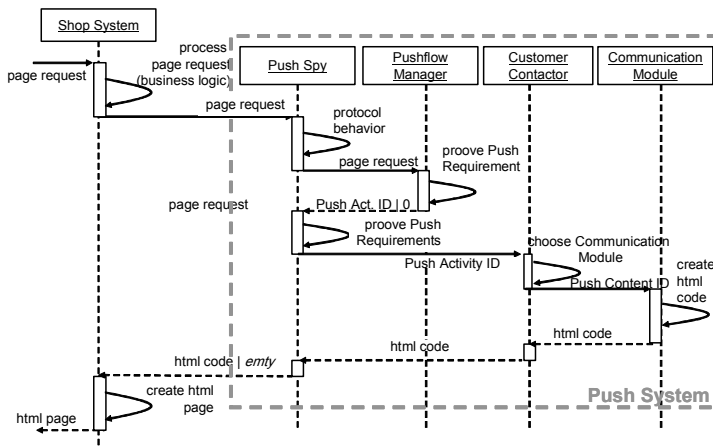


Figure 2: Logic of the push-system

In order to pass the Push Activity to the Customer Contactor the control components create a Push Activity ID which characterizes it. If there is none, a “0” is transferred. In this case no Push Message will be presented.

The fitting Communication Module is chosen by the Customer Contactor, by a comparison of a Conceptual Communication Pattern that belongs to each Push Activity with a Technical Communication Pattern that describes available media. In an everyday internet shopping, there are mostly Communication Modules in use that lead to messages on the web page. There may be urgent messages, that require pop ups, or more subtle messages, that appear in inline frames, for example. Further possibilities for Communication Modules are additional frames, banners, chats for interaction and Emails, in case the customer has already quit.

Push Contents are administrated in the Push Content Repository in a flexible way that allows the Communication Module to choose the appropriate form. For example, there are short and long text versions, to differentiate between Communication Modules with different transmission and representation possibilities. Furthermore, the message text may contain variables and formatting characteristics as well as links and multimedia elements.

Finally, for Push Activities, which are directly applied in the web shop, the html code of the Push Message is included in the page and transferred to the browser, where it is presented.

4 Pushflow Manager on Transaction Level

4.1 Identification of Push Opportunities

In order to identify Push Opportunities the Pushflow Manager has to recognize stoppages in and deviations from the regular purchase process of a customer.

Therefore, a basic process for the typical e-commerce purchase is strategically defined from theoretical and empirical analyses [Zimm97; Loos98; Korb00]. It describes the typical way of a customer from information until the final purchase.

The Pushflow Manager works with a Pushflow that derives from the basic e-commerce process. It defines all milestones in the transaction which are observable. The Pushflow Manager observes the customer during his transaction process and compares the finished steps with the Pushflow. It identifies Push Opportunities when the customer remains on the page of one transaction step for longer than a predefined time interval, does not request a directly following step, e. g. in filling in consecutive forms or aborts the transaction.

Two characteristics of e-commerce-processes make it difficult to control the transaction steps proactively:

- Individual process succession: every customer specifies the sequence of steps himself.

A rigid guidance of the customer through the transaction process is not usual in e-commerce. Different customers may choose their ways through the

hyperlinked pages. They start with information on the product or on the supplier, proceed directly to a special product and to its purchase or first have a look at different conditions of payment, for example. This freedom of choice is not limited by the Push System; it only will intervene, if the completion of the purchase is in danger. But the individual process succession poses some difficulties at the Pushflow Manager. Firstly, it is hard for it to decide, whether the customer is still on his individual and special track of the e-commerce process or already has difficulties to proceed. Secondly, if it judges a situation as Push Opportunity it basically will have to decide which subsequent activity the customer would choose – in order to support him in its completion.

- Activities which consist of the fact that the customer accepts special objects, e.g. product characteristics or conditions of payment.

The e-commerce process involves different observable activities: the request of the website, the information retrieval concerning a certain product, the adding of the product to the shopping cart, for example. Besides, the customer takes further activities which are not directly observable, but still a frequent stoppage in the e-commerce process.

These activities are of the type “object accepted”. For a successful transaction it is necessary that the customer accepts the supplier, his products and above all the terms of delivery and payment. An indicator for problems in accepting an object is the fact that the customer selects the corresponding information pages or tries to make changes that he regards necessary. If he resumes the transaction again it will be assumed that the acceptance has finally succeeded.

4.2 Release of Push Activities

Depending on the last activity, which the customer finished, the Pushflow offers different possible follow-up activities. The Push System individually determines the best suitable subsequent transaction step using the transaction history. A corresponding Push Activity is assigned to every step of the transaction.

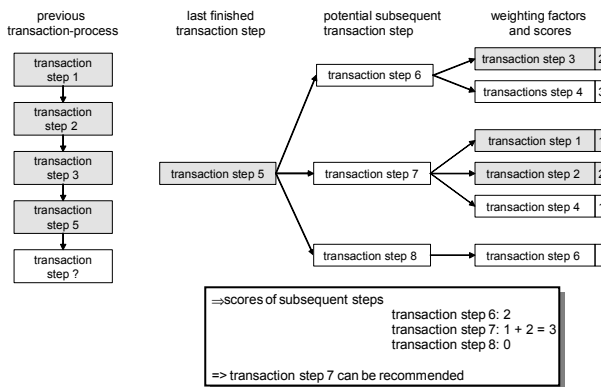


Figure 3 depicts the weighting concept of the Pushflow Manager. The previous activities of the customer in the transaction process show that he has already fulfilled steps 1, 2, 3 and 5 of the transaction. According to the Pushflow, activities 6, 7 or 8 might follow. The suitability of each possible follower depends on previously fulfilled steps, with different weights. The assignment of weights considers e. g. whether a customer acted more or less carefully in previous and assumes that he will likely act by the same way in future steps. The decision tree has been worked out for the basic Pushflow with multiple simulations and tests and has to be customized for the special setting of the supplier.

4.3 Types of Push Activities

In order lead the customer into the chosen transaction step, three kinds of Push Concepts are possible that depend on the follow-up activity.

Taking over activities

If the assumed next activity of the customer is not of type “object accepted” the supplier can take over activities. Different Push Concepts are possible according to the simplicity of the activity or the availability of information about the customer. If a well known customer has filled his shopping cart and comes to entering the order data, for example, the Pushflow Manager will display a message that proposes to finish the whole order with the data of former orders (like a one-click-order) without asking him for any confirmations. If customers usually have different delivery addresses so that the Pushflow Manager cannot be sure that it chooses the right one, he will offer completing the forms with the possibility for the customer to check it afterwards. In the case of a new customer that gets to the point, where he/she has to fill in his/her billing address, the Pushflow Manager will take this activity over with the data it already knows from the delivery address.

All Push Concepts which suggest taking over customers activities serve to simplify the continuation of the transaction in particular for the well known customer. For the supplier it leads to a further efficient process completion.

Support on transaction level

If the subsequent activity is of the type “object accepted” the supplier can not take it over in the sense of Push Concepts. He can only offer further information in order to overcome the lacking acceptance of the customer. The reasons for hesitating before an activity of this type are *dissatisfaction* or *uncertainty* of the customer. In the case of *dissatisfaction* a Push Possibility can refer to a possible *adjustment of the object* that might better suit the customer’s wishes.

All other Push Concepts supporting the transaction process with additional information aim at minimizing customers' *uncertainties* concerning the exact shape and details of the product as well as the quality of the supplier. They may be derived from principle-agent-theory that is preoccupied with information asymmetries between suppliers and customers, and the uncertainties that result from them [Haas03, 18; Jens76, 572; PiDF99, 91; Spre90, 566ff.].

In order to eliminate *uncertainties* concerning possibly *hidden characteristics* of the product, two Push Concepts are developed:

- *Screening*: The supplier supports the screening of the market with perspective to the customer by links to neutral expertise or references, for example.
- *Signaling*: By giving additional information, special contract-conditions, for example, the supplier tries to externalize the quality of its products and stands out from competition in such a way.

Besides the uncertainties concerning the product, it is a possible reason to stop the transaction if the customer doesn't know the supplier's intentions after contracting (*hidden intentions*). Regarding this, customers are interested in offers to protect themselves by additional securities, guaranties, for example. Push Concepts like an "*offer of security*" refer to these proactively.

If the customer is afraid of disadvantages resulting from *hidden actions* of the supplier, so he will probably appreciate control mechanisms. With tracking and tracing functionalities, for example, the supplier enables the customer to supervise his behavior and thereby diminishes uncertainties. In particular, the Push Concept "*offer of control*" communicates security to the customer concerning the quality of the whole transaction process.

Offer of transaction specific information

If neither the following activity is of the type "object accepted" nor the assumption is possible, that a taking over of activities would help the customer, the fitting Push Activity is of the type "Offer of transaction specific information". The Pushflow Manager simply offers to show the customer an appropriate following step in his transaction and thereby triggers his next activity.

5 Practical Experience

REHAU AG&Co possesses a large product range that leads to a customer portal with a high complexity. But an empirical analysis of qualitative customer questionings showed that many customers of REHAU are not very experienced with internet activities, so that they need a high level of support.

In addition, their motivation in engaging in webshop orders is very small. In many situations they quit their transaction processes and instead use the more comfortable traditional channels. But REHAU is interested in an electronic support of the transactions with its customers, as channels like telephone or fax are very

cost intensive. Therefore the company decided to implement the Push System that will be online by the end of 2005.

A survey of approximately 30 customers and 20 external and internal service employees leads to the Pushflow, weights of follow-up activities and the rules for its selection via comprehensive simulations (Figure 4).

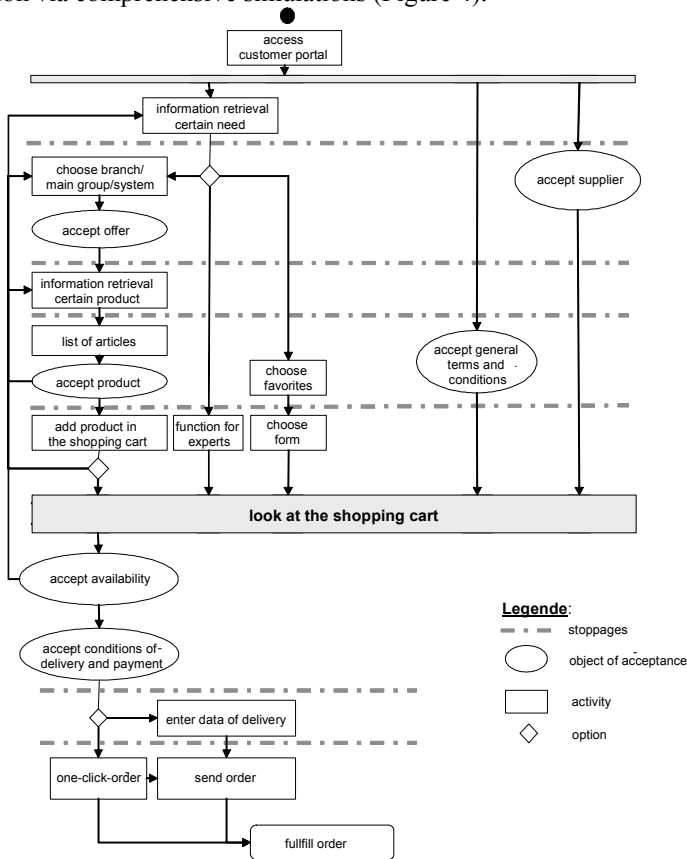


Figure 4: Transaction process in the REHAU portal

An example for a first decision on weights and subsequent activities is depicted in Table 1. The activity “request for information concerning a certain product”, possesses three possible subsequent activities: “accept supplier”, “accept offer” or the request for the “article list” in order to enter the order quantity.

If the user in the example of the table performs the activities “choose category” and “choose subcategory” without looking at information pages for the category and the subcategory, the potential successor “article list” will get 4 points. The weights of the potential followers “accept offer” and “accept supplier” only sum up to 2. The Pushflow Manager releases a Push Activity that refers to the article list.

transaction step	potential follower	performed activity	weights
request for information concerning a certain product	accept offer	choose category	1
		accept category offer	2
		choose subcategory	1
request for information concerning a certain product	accept supplier	choose category	1
		accept category offer	1
		Choose subcategory accept	1
		subcategory offer	2
request for information concerning a certain product	article list	choose category	1
		choose subcategory	3

Table 1: Weights and Push Activities in the REHAU portal

For the customer portal Push Activities are defined for every possible follow-up activity which includes the examination whether the system takes over the activity or offers only further information for the support of the e-commerce-process. If both options are possible, they are defined as two independent transaction steps. The decision between taking over the activity and the support with information is realized via weights. Some Push Activities with their characterization and the REHAU specific content are shown in Table2.

Push Activity	Push Concept	Content
support: accept product	offer of control	You could check and adapt your offer in the next step.
trigger: enter delivery dates	offer of information concerning transactions	Do you want to send the order now? We guide you to the next steps.
take over: enter delivery dates	offer to take over activities without data confirmation	Do you want to use our new one-click function?
advice: enter delivery dates	offer to take over activities with data confirmation	Shall we deliver to the same address like in your last shopping? We could enter your delivery dates.

Table 2: Push Activities and adapted contents in the REHAU portal

Figure 5 shows the realization of the Push Activity „Take over activities: input of the delivery date” in an in-frame-message of the REHAU portal.

6 Conclusion

The occupation with a Push System for e-commerce transactions started from the necessity of the supplier to cope with the high percentage of customer initiated abortions of shopping processes.

E-commerce processes as well as their possible stoppages were theoretically and empirically studied and modeled. Furthermore possible reasons of the customer for quitting a transaction were derived from literature. That led us to Push Concepts, that proceed the customer in a next transaction step. After numerous tests and simulations in our laboratory as well as surveys in different branches a Push System resulted, that realizes efficient and effective Push Concepts and may be additionally implemented in any webshop [RoZM04; RoZN04].

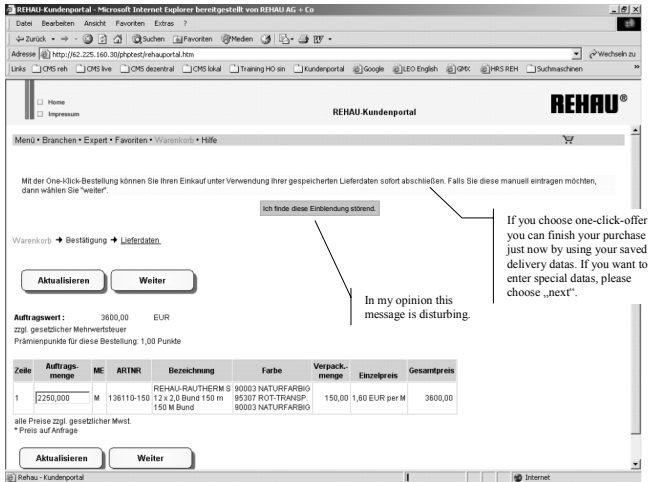


Figure 5: screenshot of a Push Activity on transaction level in the REHAU portal

Now that we have started transferring the Push System into practical settings, we gradually find out, that it does not only solve e-commerce problems, but also has the potential to add benefits to the supplier as well as the customer. Studies of acceptance of Push Activities [RoZa04] show that, although there are different preferences, the customer appreciates proactive help in general. The individual Push Activities that additionally depends on every special situation lead to a very individual service process for each possible customer. Beginners are supported, more advanced e-commerce users are satisfied if the system takes over their activities and thus fastens the transaction process. Thus satisfaction of many customer groups may be increased. Thereby the supplier does not only profit by less aborted transactions and more automatically performed purchases but from a potentially higher customer loyalty as well.

As soon as the Push System supporting the REHAU portal will be available for all customers, representative studies on the acceptance of push concepts, the validation of theoretically assumed dependencies and benefits for both customers and suppliers will follow.

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