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Visiting and Developing Together - with Media-Based Nomadic Blogging

Lech Krzanik

Department of Information Processing Science, University of Oulu, FIN-90014 Oulu, Finland
Lech.Krzanik@oulu.fi

Abstract. We introduce an innovative type of application for media-based nomadic blogging, and report on the validation experiments with a demonstrator system. The approach is particularly suitable for media-intensive applications such as information systems for heritage sites, vacation resorts, city services, etc. While blogging introduces the needed social dimension our efforts focus on other necessary features which require more investigation and good integration with the blogging functionality, such as nomadic access and collaborative decisions. Nomadic access is associated with changing contexts and switching between virtual media and real objects. Collaborative decisions provide additional guidance, and occasionally restrictions, to the blogging activity. The SCOUT demonstrator system, a framework for constructing contextual and media-based nomadic blogging systems, was deployed at a ski resort. We provide conclusions from the experiments and give indications regarding further research.

Keywords: Virtual heritage - applied technologies and systems; mobile devices and their application; virtual environments and virtual experiences; social dimensions of virtual heritage; virtual heritage and museum environments.

1 Introduction

SCOUT is a framework for constructing contextual and media-based systems for nomadic blogging. The approach is particularly suitable for media-intensive applications such as information systems for heritage sites, resorts, city services, etc. SCOUT has been developed to refine and validate the approach. The investigated functionality includes both application operation, e.g., support for visiting places of interest, and development, e.g., determining requirements and design specifications for system evolution. The social dimension is realized with blogging supported with nomadic access. User-participative public decisions are exposed at various stages of the relevant decision-making process. The decisions may react to the changing ways a site meets visitors' expectations. For development, they might cover expressing interest through specification of needs, to design, delivery planning, the deliveries,

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stakeholder feedback, etc. SCOUT has been developed in project Nomadic Media[1]. It extends previous platforms for contextual systems [15] and related applications such as city information systems [12], contextual emergency decision making [13], and Nomadic Bastides [14]. In this paper we take a technical viewpoint and investigate how systems for visiting and developing together - with media-based nomadic blogging - can be constructed and whether they provide a valid solution.

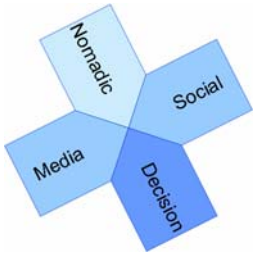

Fig. 1. The four aspects of nomadic media.

There are four fundamental aspects to consider: the media aspect, the nomadic aspect, the social (blogging) aspect and the decision aspect. *Media* represent and extend reality. With changing contexts the users switch between possibly multiple virtual representations and the real. The representations may be shared in various social structures that link individual users. Media are also important for illustrating and motivating the various decision processes related to an application's operation and evolution. A *nomadic* system has the ability to recognize and adapt to changing contexts, which are built from elements such as place, time, physical characteristics, device and communications capabilities, etc. An application's context may include characteristics of the particular concrete target domain - such as heritage site, vacation resort, city, etc. - as well as context information related specifically to users, local and remote, their interaction devices and communication modes. The physical (possibly transient) presence in the domain allows an agent to use local communication modes such as NFC (Near Field Communication) - which allows devices such as a cash register and a phone to exchange information with a simple wave or a tap, in order to pay for items via cell phone, to get information from NFC-enabled exhibits or posters, etc[2]. At a heritage site one could wave phone near an NFC-enabled exhibit and the handset would connect to a Web site where you could listen to a clip, buy tickets for an associated event, etc. The *social* aspect represented as relationships between agents of an information system may trigger various actions such as getting interested in, accessing and using the system, expressing opinions, initiating development actions,

[1] Project E!2023 ITEA Nomadic Media

[2] NFC (Near Field Communication) is a short-range radio technology that operates on the 13.56 MHz frequency and can transfer data at a top speed of 0.42 Mbps over a distance as wide as about 4 cm. It doesn't interfere with BT or Wi-Fi. Trial uses have been deployed by various operators such as bus ticket selling (e.g., Germany), shopping at some stores (Netherlands), and subway ticket selling (US). 30% of cell phones should be NFC-enabled by 2011 [Metz].

etc. The social structure may cross-cut many local contexts. In this paper blogging supports social aspects of an application. The *decision* aspect addresses the choices made by and for the agents under varying contexts and varying user communities. For single user-based blogs the decisions most often respond to the changing context of a nomadic user. The decision aspect may refer to application operation as well as development. The process can be modelled as game. Decisions can be made automatically by the application, according to a set of specified parameters, or they can be explicitly made by users with the application's support. This paper refers to examples of operation activity – visiting locations of interest, and system evolution activity – collective development of an application. Examples of the respective decision processes include, respectively, support for selecting an itinerary and support for collective incremental requirements and architecture specification.

In next sections we provide more information about conventional and nomadic blogging. Then the SCOUT system that supports nomadic blogging and its validation is discussed. Finally we review the related results, provide conclusions and outline future work.

2 Nomadic Blogging

In conventional sense, a blog is a website containing journal-style entries written by a single user, often presented in reversed chronological order, possibly with room for comments. The essential infrastructure for blogs includes the RSS mechanism which allows subscribing to a page, with notification every time that page changes. Often considered an element of the so-called live Web, this kind of link is much stronger than a usual bookmark or a link to a page, and can be used to push all kinds of data, e.g., media of a virtual model. Moreover, with a trackback mechanism it is possible to see when anyone else links to a page and react with reciprocal links or by adding comments. Tags are commonly used for organising and categorising the blog space. Through repeated collective usage of tags aggregated tag information or "tagsonomy" emerges. The resulting blogosphere [3] is a social networking system designed to encourage participation. The link structure supports predicting useful aspects of data [20]. The number of blogs has grown exponentially [21].

Nomadic blogging takes into account the dynamic nature of nomadic bloggers. A suitable infrastructure for generating nomadic blog entries is shown in Fig. 2. Contexts and the resulting cooperation social structures become dynamic in time and space. Agents A (bloggers) may access the real objects (when in suitable context) or a virtual model of the site, both managed by a site business area B, and generate blog entries with references to respective real objects and virtual media. Agents cooperate to form a social structure C. B provides support with media services, tag taxonomies, etc. On the other hand, B defines the business processes of interest. As a consequence of dynamic and contextual agents and business areas, also the social structures are dynamic. Because blog entries may be automatically generated on changing (e.g., entering/exiting) contexts, much of a nomadic blogging feed will result from dynamic contexts. The agent contexts can include such elements as dynamic parts of personal profiles, types of devices in use (phones, PDAs, large screens, etc.) and

communication modes (BT, Wi-Fi, NFC, etc.) Geographic representations as well as selected properties of interest active in the involved decision processes may be parts of both agent and business area contexts. The business areas are able to determine whether their contexts and the contexts of the agents overlap or are disjoint.

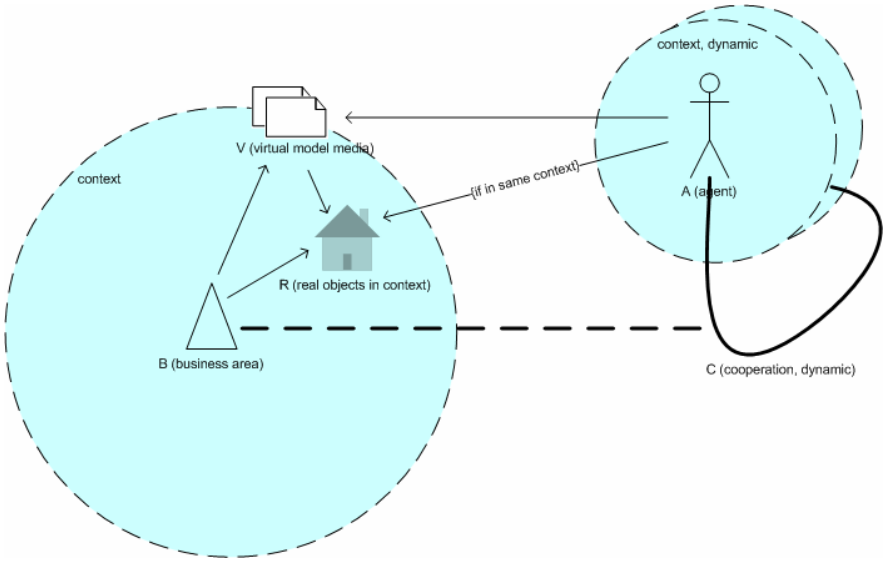

Fig. 2. The ABC infrastructure for generating nomadic blog entries.

2.1 Types of Content in Nomadic Blogging

With the simple principles of nomadic blogging we can associate various decision processes and their stages with distinct types of blogging content. Two broad types of content (cf. Fig. 3) include content representing the state of the business area (e.g., a heritage site) – reflecting the operation perspective – and the content representing development of the business area – reflecting the evolution perspective. The types require producing specific different analysis information being the background for taking different decisions. Conventional blogging offers a number of public blogosphere analysis services, such as Nielsen BuzzMetrics' BlogPulse [19]. Similar services can be created for nomadic blogging. A simple "buzz" trend was also used in our experiments. There are options for calculating various trends.

For analysis and development of advanced properties one needs taxonomy of characteristics which may be specific to a particular application domain. A convenient approach divides all characteristics into behavioural functions and quantitative quality or resource attributes. Usability is an example of the latter. The taxonomy supports analysis and specification of the requirements, and developing the business area changes. Several possible methodologies exist suitable for defining details of various

more detailed specification types. Reference [8] provides a convenient and usable alternative which is used in the SCOUT approach.

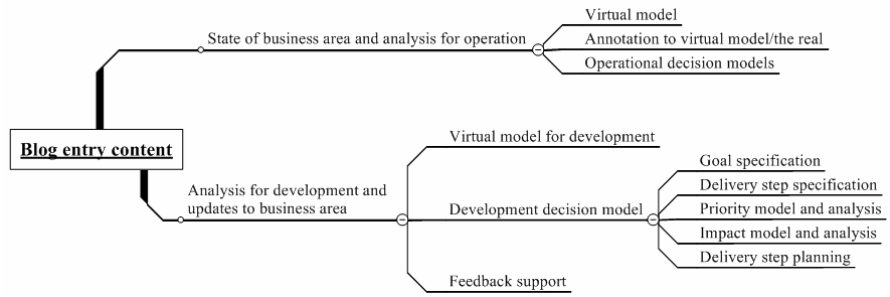

Fig. 3. Categories of content for nomadic blogging.

Table 1 lists types of content entries for nomadic blogging for heritage and resort applications derived from the SCOUT system. The column Media Category corresponds to the classification outlined above and may include the following broad categories: Virtual model, Decision model, Annotation to the real, Annotation to a virtual model, Annotation to a decision model. The decision model is a composite category containing performance index, constraints, output dynamics (solution specifications) for the selected type of solutions, and delivery plan. Various problem solving approaches may be applied such as optimal programming, game or control approaches, as well as various specification languages for requirements, constraints and solutions, therefore these broad categories are further refined for applications derived from the SCOUT system. Part of this refinement is sown in columns Media Type and Instance. For virtual models and most of annotations they show the applied media modes. For the Decision category Media Type tells more about the particular aspect of decision making. We distinguish Means (design specifications) from Ends (specifications of requirements, performance indices, etc.) and Delivery Plan. The Ends type also accommodates various kinds of feedback to support evolutionary delivery strategies.[3] Our approach includes an option for rigorous quality control of all decision making entries; the respective decision types equipped with such an option have the name with suffixed with "quality control". The Context Sensitivity column lists critical elements of context applicable the content type. The last column indicates how the creation or update of an entry is triggered. The particular entry types may remain the responsibility of either the agents or the business areas.

Table 1. Types of content entries for nomadic blogging.

Case	*Media Category*	*Media Type*	*Instance*	*Context Sensitivity*	*Trigger*
1	Virtual	Video	Interactive 3D image	None	User-invoked
2	Virtual	Graphics	Map	Location	On handset discovery or user-invoked

[3] Detailed discussion of the decision-making policies and the specifics of the corresponding entry types remain beyond the scope of this paper. For example [8] presents a general approach suitable for nomadic blogging applications.

3	Annotation to real/virtual	Graphics	Annotation	Location, object, user profile	On handset discovery or user-invoked or tap/wave with a NFC-phone
4	Annotation to real/virtual	Audio	Area story	Location, user profile	On handset discovery or user-invoked
5	Annotation to real/virtual	Audio	Exhibit story	Object, user profile	Tap/wave with a NFC-phone
6	Annotation to real/virtual or to decision	Any (e.g., a text line)	Explicit blog entry	None or location, object, user profile	On handset discovery or user-invoked or tap/wave with a NFC-phone
7	Annotation to real/virtual and to decision	Compo-site	Feed of implicit blog entries	As for annotated instances	User- invoked
8	Decision	Ends	Function diagram Quality diagram Virtual model with extensions	Location, object, user profile	User-invoked or tap/wave with a NFC-phone
9	Decision	Means	Means diagram Virtual model with extensions	Location, object, user profile	User-invoked or tap/wave with a NFC-phone
10	Decision	Delivery plan	Means diagram Virtual model with extensions	Location, object, user profile	User-invoked or tap/wave with a NFC-phone
11	Decision	Delivery plan	Function diagram Quality diagram Virtual model with extensions	Location, object, user profile	Automatic (current delivery) or on handset discovery or user-invoked (latest delivery)
12	Decision	Ends quality control	Ends presentation (specification, delivery, feedback)	None	User-invoked or special policy (e.g., on specification)
13	Decision	Means quality control	Means presentation	None	User-invoked or special policy (e.g., on specification)
14	Decision	Means	Blog metrics	None	User-invoked or special policy (e.g., on delivery, on quality control)

3 SCOUT

SCOUT is a framework for constructing contextual media-based systems for nomadic blogging. Complete nomadic blogging applications can be derived from SCOUT, for instance for heritage or resort site information systems.

3.1 Functional Architecture

An application has blackboard architecture [2] with blog entry feasibility conditions defined as workflow. An example of such workflow for the blog entry types listed in Table 1 is shown Fig. 4. Each time an entry of the category “Decision” is invoked the relevant feasibility conditions are checked. The strategy is to advance the workflow to its final state. That would ultimately contribute to reaching the operational (e.g., for

"visiting together") or evolution (for "developing together") goals. A variety of incentives are defined that correspond to the goals. The conditions are not obligatory although entries which do not adhere to the rules will not advance the workflow.

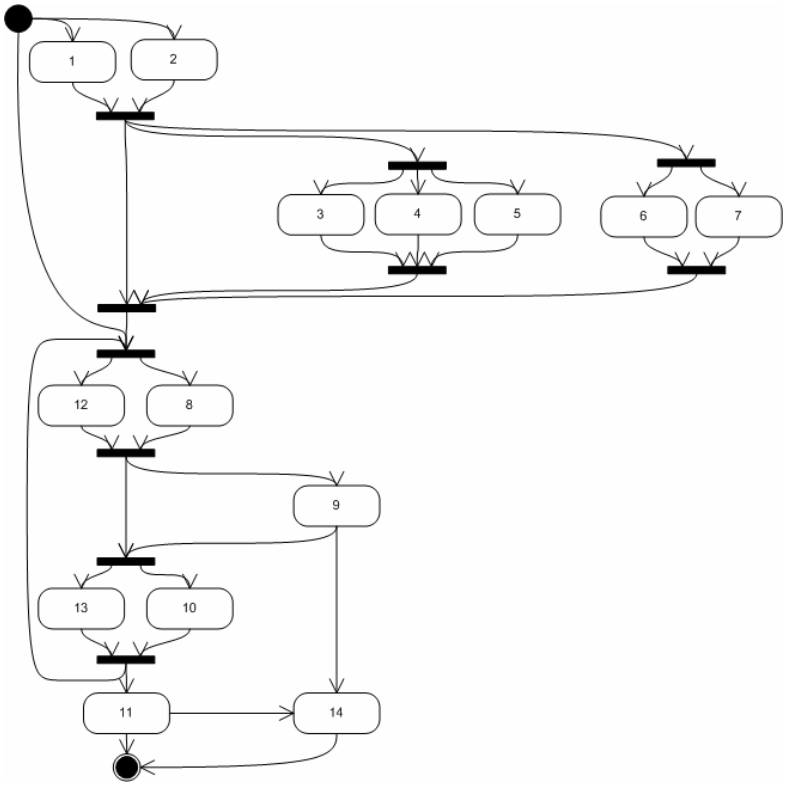

Fig. 4. A workflow generated from blog entry types in Table 1. Numbers represent type cases.

3.2 Deployment Architecture

The deployment architecture for an application derived from SCOUT is demonstrated in Fig. 5. The major subsystems are the Context and Business Area subsystem, the Gateway subsystem, the Backend Services subsystem, the Database Service subsystem, and the External Services Subsystem. An application can use the NFC, BT and Wi-Fi protocols [10] for local communication and a set of suitable gateways. Several types of user devices can be supported including mobile phones, PDAs and large screens. A range of backend database, business and media services implement the nomadic blogging functionality.

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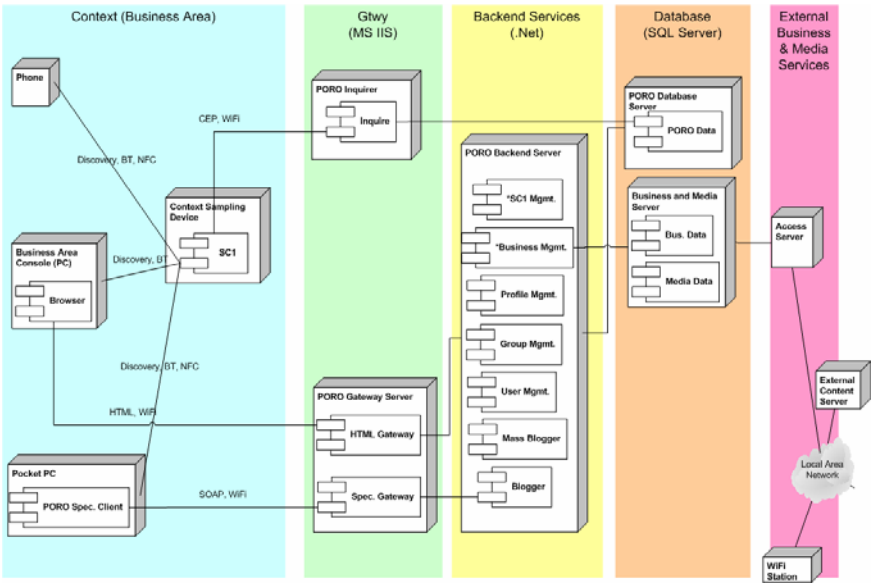

Fig. 5. An example of deployment architecture of the application derived from SCOUT.

3.3 Demonstrator and Validation

An experimental system has been installed to validate the approach. It run at a ski resort Ruka (Fig. 6.) We reached the overall conclusion that nomadic blogging provides a meaningful alternative to conventional blogging. However, more investigation and validation is necessary. In general all four critical aspects of the application – media-based, nomadic, blogging and decision – confirmed their value as well as the potential for further development. The results listed here will be combined with other experiments to provide a more elaborate report.

A collection of predefined scenarios had been defined which referred to various areas of activity of the resort. Both operation and evolution were addressed. The actual blogging activity took place mostly at meal times and at evenings, but on several occasions also at other times to react to certain emergent situations on the slope. The media-based blogging part went pretty smoothly – possibly thanks to the experience in conventional blogging among some of the participants. On the other hand the development aspects were less easy. Most of the development content referred to the development of the decision part of the demonstrator. Below several further conclusions are collected:

- Only small user devices were used in the demonstrator such as phones and PDAs which restricted application of certain media types. The devices were good for simple blogging but not so good for more elaborate media cases. It has been proposed that for entry types where larger display sizes are

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important the suitable special devices could be provided by the business areas.

- The business areas should provide or at least support creation of more complex referenced media instances.
- The ability to switch between virtual models and the real objects received very good opinions.
- Of particular interest was visualization of the nomadic blogosphere. Because of the transient nature of nomadic blogosphere the visualization had to be different than in conventional cases (cf. the suggested visualization in Fig. 6).
- The collaborative decision making process was at first not well understood but after initial specifications appeared it gradually started to receive positive opinions. In particular the attribute (quality and resource) part of the "ends" specification needed further clarification. Finally the concept of the function/attribute dimensions for development was considered adequate. In particular, the concept of attribute measurement was not well understood. It started to receive positive opinions after discovering that a single specification format can be conveniently used for visualization of various versions and variants of requirements, reference benchmarks, and stakeholder feedback. We were able to support the function part with a tag analysis algorithm based on the available feeds but there was no corresponding straightforward support for the attribute part.
- More complicated decision workflows didn't work. The usability of the application at this point was not satisfactory. In effect instances of many more complicated workflows did not advance as expected and remained at early stages.
- The experiments addressed small communities of up to 10 users and up to 4 business areas. Larger communities require additional experiments to investigate possibly different social and technical effects.

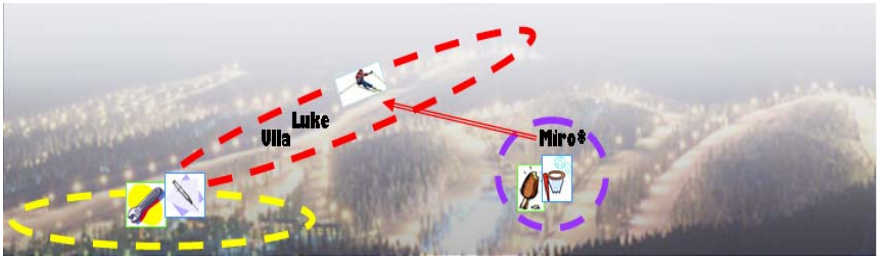

Fig. 6. Visualization of the blogosphere for the Ruka demonstrator: There are three active agents occupying two of three available business areas (in principle only assignment to areas is shown, not agent positioning). The icons are used to tag selected business areas. There is a reciprocal remote link between Miro and the skiing area. Miro has a running decision process at the stage of specifying goals (marked with asterisk); the decision process can also be visualized separately.

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4 Related Work and Discussion

There are extensive references regarding all four main aspects considered: media-intensive, nomadic, blogging and decision support, although the approach as a whole is new. Perhaps the development aspects are the most controversial and worth more elaborate discussion. Alternatives to blogging as a social mechanism for development include wikis, e.g., [1, 7], however wikis seem less flexible and occasionally over-structured and too complicated. One of the issues discovered by validation experiments was the difficulty in understanding the specification principles for development and problems with deriving the attribute information from blogs. There is relatively extensive body of research devoted to blog analysis: [18] presents a review of conventional methods for blog analysis. An interesting method using tags in blog evaluations has been presented by [11]. While the functional characteristics are relatively easy to derive, the analysis of non-functional attributes is difficult and there are hardly any references available. SCOUT uses a template approach to structure the information for attribute analysis and uses simple techniques similar to search methods used currently also in [9, 19, 23], etc. There is of course a fundamental difference in the definition of the search space – SCOUT operates on federated local contexts. For comparison, Fig. 7 shows an example derived with BlogPulse. Other tools exist with a range of options for calculating various trends.

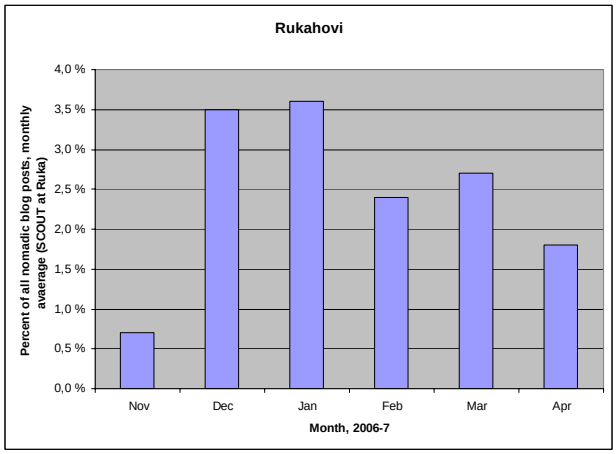

Fig. 7. Buzz trend for experimental system at ski resort site Ruka (2006-7).

Another important difference with regard to conventional blogging systems [3], pervasive systems [22, 10] and design systems [8] is that SCOUT intends to integrate extensive media from different sources and domains, and redefines some conventional representations of data. For example our representation of blogosphere (see Fig. 6) differs considerably from representations used in mainstream blogging, e.g., [5, 4]. There are various proposals for certain types of integration, e.g., [6], but principles of integration for nomadic blogging require further research.

5 Conclusions and Future Work

SCOUT, which was originally devised as a framework for constructing extremely minimal, purpose-built local nomadic environments for precluded areas such as World-Heritage listed sites (hence the name), has recently evolved towards media-intensive systems, with a developed social and decision side, addressing also quite different types of sites. The approach is potentially widely applicable. Nevertheless further research and experimenting is needed in all four directions mentioned in this paper: media-intensive, nomadic, blogging and decision support, in particular for the development function. We currently focus on the evolution aspect with the aim to produce environments with extensive development support [16]. The investigation takes a constructive approach with frequent releases of demonstrators.

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References

1. Bachmann, F., and Merson, P.: Experience Using the Web-Based Tool Wiki for Architecture Documentation. *Technical Note* CMU/SEI-2005-TN-041 (Sept 2005)
2. Bass, L., et al.: *Software Architecture in Practice, 2nd Ed.*. Addison-Wesley Longman, Inc., Reading, MA (2003)
3. Blood, R.: How blogging software reshapes the online community, *Comm. ACM*, 47, Nr. 2 (2004)
4. Bulters, J., and de Rijke, M.: Discovering Weblog Communities: A Content- and Topology-Based Approach. *Proc. Intl. Conf. on Weblogs and Social Media.* Boulder, Co. (2007)
5. Duarte, F., et al.: Traffic Characteristics and Communication Patterns in Blogosphere. *Proc. Intl. Conf. on Weblogs and Social Media.* Boulder, Co. (2007)
6. Flickr: Great shot - where'd you take that?, http://blog.flickr.com/en/2006/08/28/great-shot-whered-you-take-that/, http://www.flickr.com/help/screencasts/vol1 (Apr 2007)
7. Forbes: Welcome To The Corporate Org Chart Wiki, http://www.forbes.com/2007/04/24/wiki-companies-chart-cx_0424wiki.html (Apr 2007)
8. Gilb, T.: *Competitive Engineering: A Handbook For Systems Engineering, Requirements Engineering, and Software Engineering Using Planguage*, Butterworth-Heinemann (2005)
9. Google Trends: http://www.google.com/trends (Apr 2007)
10. Hansmann, M., et al.: *Pervasive Computing*, 2nd Ed., Springer (2004)
11. Hayes, C., and Avesani, P.: Using Tags and Clustering to Identify Topic-Relevant Blogs. *Proc. Intl. Conf. on Weblogs and Social Media.* Boulder, Co. (2007)
12. Krzanik, L., and Mäkäräinen, M.: Experiments in the Digital 'Engineering City Oulu', *Lecture Notes in Computer Science*, Vol. 1765, Springer (2000)
13. Krzanik, L., Kuvaja, P., and Bendas, D.: A Platform to Support Non-Computer Experts in Development of Ubiquitous Computing Games. *Proc. of Workshop on Designing Ubiquitous Computing Games*, UbiComp 2001, Atlanta, GA, USA (2001)

14. Krzanik, L.: Mobile bastides: Flexible and evolvable business-oriented contextual media. *Proc. of the 11th International Conference on Virtual Systems and Multimedia VSMM2005.* H. Thwaites, Ed., Archaeolingua, Ghent (2005)
15. Krzanik, L., et al.: Usability-Driven Evolution of Context-sensitive Nomadic Media, *Proc. MUM'05 Conf.*, Christchurch (2005)
16. Krzanik, L.: Simple Evolution of Complex Web Systems. In: J. Cordeiro (Ed.), *Proc. Of International Conference on Web Information Systems and Technologies.* Barcelona (2007)
17. Metz, R.: 5 Wireless Breakthroughs. *Laptop* (March 2007)
18. Nicolov, N., et al. (Ed.): *Intl. Conf. on Weblogs and Social Media. Proceedings*. ICWSM, Boulder, Co. (2007)
19. Nielsen BuzzMetrics' BlogPulse: http://www.blogpulse.com/ (Apr 2007)
20. O'Reilly, T.: What Is Web 2.0, http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html?page=1 (2005)
21. Sifry, D.: State of the Blogosphere: Part 1 – On Blogosphere Growth. http://technorati.com/weblog/2006/04/96.html (March 2007)
22. Streitz, N., et al.: Situated Interaction with Ambient Information: Facilitating Awareness and Communication in Ubiquitous Work Environments. In: *Tenth Intl. Conf. on Human-Computer Interaction* (2003)
23. Technorati: http://www.technorati.com/ (Apr 2007).