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Summative Evaluation of Creativity Support Technologies in the First INJECT Journalism Ecosystem

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Executive Summary

This deliverable reports the method and results from the summative evaluation of a specialised version of the INJECT tool in use in three regional Norwegian newspapers over a 2-month period in early 2018, to investigate three research questions related to the tool's support for and impact on journalist creativity, productivity and newsroom completeness. The summative evaluation showed successes in the implementation of INJECT and revealed that the tool was used by most of the journalists in their daily work, even if the version of it that was made available to the newsrooms was not optimized for the newsrooms by the INJECT team. The evaluation shows that the INJECT tool was used by the journalists to different degrees in the different newsrooms, and was used more to write feature stories about social and cultural issues rather than hard news stories. Most journalists reported that INJECT's features were best suited to supporting the writing of feature articles. Although journalists' use of the INJECT tool did not increase the perceived ratings values of news stories that were written with the support of the tool, journalist use of the INJECT tool did increase the perceived novelty ratings of news stories that were written with the support of the tool. The evaluation revealed that use of the INJECT tool did not contribute directly or indirectly to journalist productivity or newsroom competitiveness, that in practice, creativity was not linked too strongly to journalist productivity or newsroom competitiveness as was expected by the INJECT consortium. As a result, we can conclude that journalists' use of the INJECT tool increased the rated creativity of news stories written with the support of the INJECT tool compared to without this support. Moreover, increased use of the INJECT tool was associated with journalists' willingness to investigate new work practices, openness to new technologies and management direction to use these technologies, and support from other journalists who were also using INJECT in each newsroom.

1 Introduction

This deliverable reports the summative evaluation of the effectiveness of INJECT's creativity support technologies with three regional newspapers in the first INJECT ecosystem, in Norway. A version of the INJECT tool, adapted to the needs and constraints of the three local newsrooms, was made available to 12 journalists over a continuous 2-month period at the start of 2018 (as mentioned in Deliverables D1.2, D1.3 and D2.1).

To explore the comparative effectiveness of the INJECT tool in the three newsrooms, the authors collected data about INJECT use and outputs during the 2-month period, as well as from a corresponding earlier 12-month period in the three newsrooms. This deliverable reports the results of analysis of data that was collected to investigate claims for improved journalist creativity, increased journalist productivity and increased news SME competitiveness that resulted from initial uptake of the INJECT tool in three Norwegian newsrooms. In particular, the data analysed to investigate three research questions:

RQ1: Did journalist use of the INJECT tool increase the creativity of the news stories produced with the support of the INJECT tool?

RQ2: Did journalist use of the INJECT tool increase the productivity of the journalists to produce news stories with the support of the INJECT tool?

RQ3: Did journalist use of the INJECT tool provide evidence that can improve the competitiveness of the newsrooms that used the INJECT tool?

The strategic causes-and-effects that INJECT sought to deliver are extracted from the project's description of work, and shown again in Figure 1.

Figure 1: The strategic causes-and-effects that INJECT will seek to deliver in European journalism

The project argued that increased journalist creativity was key to research success, and if achieved would in turn cause increases in journalist productivity and newsroom competitiveness. Therefore, as INJECT was introduced into the three newsrooms primarily as a tool to support journalist creativity, the data and analysis will focus primarily on the first research question RQ1. Secondary data and analyses will be reported to investigate research questions RQ2 and RQ3. The remainder of this deliverable

sets the context for the summative evaluation, and then reports the mixed-method approach and key results, before concluding with answers to the three research questions RQ1, RQ2 and RQ3, and key lessons learned.

2 The Summative Evaluation

In contrast to the earlier formative evaluations of the INJECT tool, which collected feedback with which to improve the design of the tool in the first 12 months of the project, the summative evaluation was an assessment at the end of an operating cycle to determine whether the goals of that cycle were achieved. Both quantitative and qualitative methods were used to collect and analyse data about use of the INJECT tool. Furthermore, the evaluation was designed to deliver validated learning as a means of obtaining realistic insights about the future development and rollouts of the INJECT tool and associated services.

The summative evaluation took place from m14 to m16. The task leaders were the University of Bergen and City, University of London. The contributors were the three participating Norwegian newspapers Hordaland, Sunnhordland and Hallingdølen (which we refer to as HO, SU and HA throughout this deliverable) and innovation partners M'Labs. The summative evaluation collected data from the Norwegian ecosystem, as it is the most established ecosystem in place in this period.

To provide a platform for the summative evaluation, the INJECT tool had been introduced as early as m9 into the three Norwegian newsrooms. Their journalists have already been trained to use INJECT in a process supported by University of Bergen, who acted as the tutor, M'Labs and technical support provided by ICCS and City, University of London.

2.1 The Evaluated Version of the INJECT Digital Tool

The summative evaluation took place with production versions of the INJECT tool that were released between m14 and m16 of the project. Most version changes that took place over the period were small software bug fixes. Furthermore, over the 2-month period, the number of public news articles that the tool manipulated to deliver creative guidance increased from 3million to 3.5million. A detailed version of the tool is reported in Deliverable D1.3. However, the version of INJECT that was evaluated had the following specific features that were designed to support use in the Norwegian regional newspaper ecosystem. In this section we first provide the technical context elaborating on the use of INJECT for this evaluation, then include language and news archive access specific to the Norwegian ecosystem.

2.1.1 Creative Strategies for News Angles

The INJECT tool deployed in the three newsrooms was implemented with four of the six creative strategies to discover news angles, based on the most robust strategies available at the time:

A. People: Discover and examine information about people associated with the news story;

B. Quantifiable: Discover and examine quantified information associated with the news story;

C. Causal: Discover and examine information about events associated with the background of the news story;

D. Quirky: discover and examine comical information associated with the news story.

Two examples of INJECT's creativity guidance generated with two of these strategies in Norwegian are depicted in Figure 2. The left side of the Figure shows the INJECT sidebar embedded into the Adobe InCopy text editor, and the right sideshows the INJECT web application that most journalists used throughout the 2-month evaluation period (technical developments that have been explained in Deliverables D1.2 and D1.3).

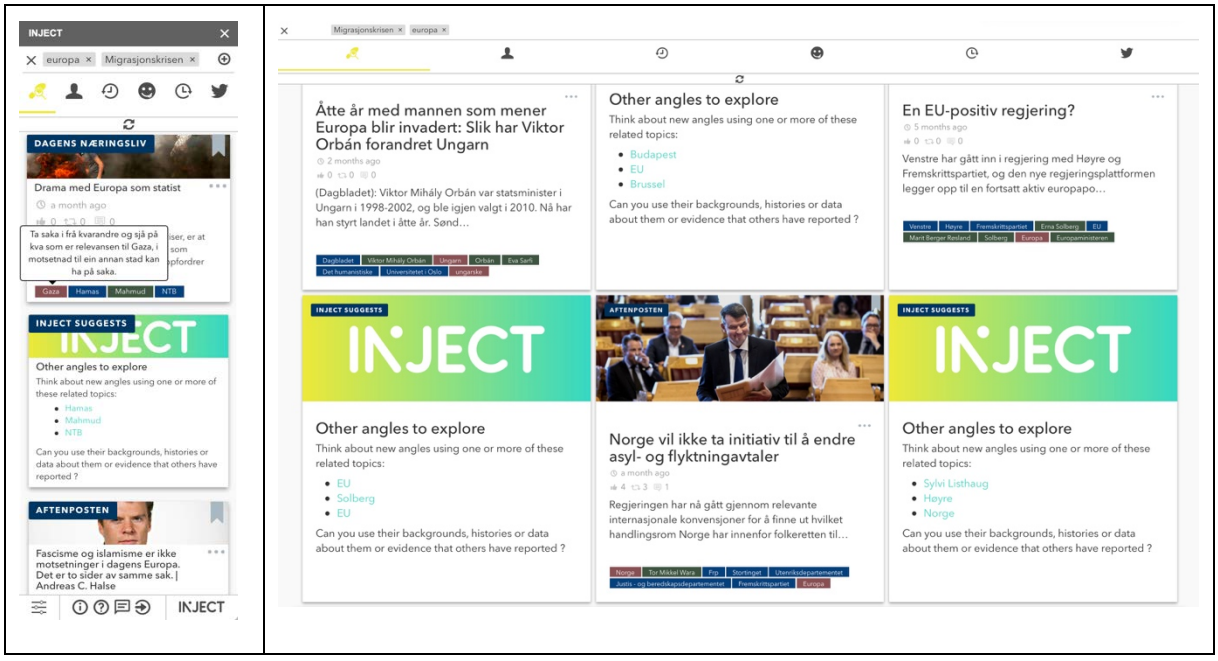

Figure 2: Two screenshots from the Norwegian-language settings with INJECT. The left side shows the sidebar available in the Adobe InCopy text editor. The right side shows the web application version used during the summative evaluation period

2.1.2 Native Language Adaptation

The 12 journalists who participated in the summative evaluation were Norwegian-language journalists. Therefore, the INJECT tool was set up for use in the three newsrooms in both the Norwegian and English languages, this meant that each journalist could interact with INJECT in both the English and Norwegian languages. Furthermore, each journalist was able to request and use articles written in both English and Norwegian to discover new angles on news stories.

2.1.3 Digital News Archives

Table 1 summarises the information sources that INJECT had indexed at the start and end dates of the evaluation. The default version of INJECT manipulated news stories from public news sources written in English and Norwegian. Totals of these news stories increased with indexing as described in Table 1. Furthermore, to integrate with local news archives and support journalists to discover new angles using context-specific sources, INJECT indexes, stores and retrieves full news information from news archives made available by INJECT partners. To enable the evaluation, it had indexed and retrieved 62,160 news stories published by three regional Norwegian newspapers between the 1st January 2015 and the 17th February 2018. This news archive was accessible to journalists in these three newspapers, to discover new angles using local information sources.

	At start of the evaluation	**At end of the evaluation**
Number of indexed Norwegian language news stories (from xx titles)	260,000	300,000
Number of indexed English language news stories (from xx titles)	2.7 million	3.2 million
Number of indexed Norwegian language stories from own archive	62,160	62,160
Number of digital political cartoons	48,000	50,000

Table 1: Indexed news stories of different types searchable by INJECT at the start and end of the evaluation period

2.1.4 Software Versions

The three newsrooms had installed Adobe InCopy so the default text editor for journalists to use, so this version of the INJECT sidebar was made available to them for use by their journalists. However, the local technical support failed to integrate the INJECT sidebar into the InCopy text editor in use in the three newsrooms. Therefore, journalists in the three newsrooms were required to use the web application version of INJECT in a separate browser window shown on the right side of Figure 2.

Login persistence is a necessary requirement to put in place the pricing model envisaged in the Norwegian ecosystem. Therefore, an authentication service made it possible for individual journalists to use INJECT by signing up with their email addresses.

2.2 The Norwegian ecosystem

The INJECT Norwegian ecosystem consists of the following services and partners:

- Innovation partners: City, University of London; Explaain and Athens Technical University
- Commercial partner: M'Labs
- Newspaper clients: HO, HA and SU
- Evaluation partners: University of Bergen and University of Groningen.

HO is a local newspaper for the geographical area of Voss, Vaksdal, Modal, Evanger, Granvin, Ulvik. Established in 1883 it is family owned with a hardcopy circulation of 8,100 three days a week and 22,000 daily online readers. SU is a local newspaper for the geographical area Stord, Fitjar, Bømlo, Tysnes and Kvinnherad. It is also family owned and was established 1902. Its circulation in hard copy is 6,200 three days a week with 21,000 daily online readers. The third newspaper HA is a local newspaper for the geographical area of Flå, Gol, Hemsedal, Ål, Nesbyen, and Hol. Family owned, established in 1936, its circulation is 8800 three days a week with 17,000 daily online readers.

The three newspapers allocated the EU resources to allow four journalists each to spend extra time being involved in using INJECT in the given period. For each of three newspapers partners a number of journalists were invited to participate by their editors.

3 Methods and Data

This section describes the mixed methods that were used to collect and analysis all of the data from the summative evaluation. We used a mixed-method approach, combining qualitative and quantitative data collection. First, the summative evaluation yielded concrete outcomes such as published news stories, about which quantitative data could be collected and analysed. Second, concepts such as the creativity of an outcome and productivity gains can be measured quantitatively, based on data generated from qualitative judgements. Third, data about how the journalists did or did not use INJECT, and its possible impacts in newsrooms, was captured most effectively using qualitative feedback that required different forms of analysis.

The evaluation was undertaken with four different working and professional journalists at each of the three newspapers. In accordance with current data protection ethics, the data was anonymised and the identities of the 12 journalists were not recorded. The following codes were allocated to identify the 12 journalists in the evaluation results: at HO: Ho1, Ho2, Ho3, Ho4; at SU: Su1, Su2, Su3, Su4; and at HA: Ha1, Ha2, Ha3, Ha4.

3.1 The Collected Quantitative Data

The data collection for the quantitative evaluation spanned the period of 23 January 2018 to 22 March 2018 – two calendar months. During this period the evaluation data was collected from three different sources: 1) all articles written using INJECT; 2) a structured log updated weekly by each journalist; and 3) metrics on page views, unique readers and time spent on page collected from Cxense.

The data collection focused on understanding the journalist's use of INJECT to support journalists' creativity and productivity. This data included published news stories that were produced with at least some use and support from INJECT, journalists' logging their own use of INJECT, and metrics about the readership of the articles from Cxense, a data management platform used by the three newspapers with which to gather metrics about user interaction and provide statistics and subscription services. The research team used this tool to collect data about page views, unique users and time spent on page. The data was registered two days after publication of each news article, to ensure equal measurement for all of the analysed news articles.

Using the digital log, each participating journalist indicated whether each used INJECT's support during the development of the news story. The following definitions were used:

- An article written with support from INJECT was an article in which the journalist interacted with the INJECT tool such that the journalist was able to generate at least one angle that was

in the published story that was new to the journalist at the time of writing, or the journalist interacted with INJECT but it did not generate an angle in the published story;

- An article written without the support from INJECT was an article in which the journalist did not interact with INJECT, for example all stories written before INJECT was designed, or did interact with INJECT but did not generate at least one angle that was in the published story.

All articles written with the help of INJECT were downloaded from the online edition and stored in PDF format. The articles were then analysed and coded for the following variables:

- The newspaper;
- Paper or online edition;
- Date of publication;
- Time of publication;
- Pay wall or not;
- The author;
- Genre;
- Number of words;
- Hyperlinks (internal);
- Hyperlinks (external);
- Number of sources;
- Number of photos;
- Number of videos;
- Number of illustrations, maps and other graphic;
- Topic category (i.e. social issues, politics etc.).

Each of the 12 journalists used the weekly log to answer eight questions about the number of articles they were working on and had finished, how much time they spent and how they spent it and the usefulness and satisfaction with INJECT. The full set of log fields that each journalist completed about each news article that was completed with support from INJECT was:

- The number of news articles worked on simultaneously;
- The time spent preparing the news article;

- The rime spent writing the news article;
- The usefulness of INJECT – free form answer;
- The ideas for the news article from sources other than INJECT – free form answer;
- The journalist's satisfaction with the news article;
- The journalist's satisfaction with support from INJECT for the news article;
- The journalist's satisfaction with support from INJECT for the news article – free form comments.

The logs were reviewed weekly, and played an important role in ensuring all articles written with INJECT had been collected.

3.2 Expert Creativity Assessment

To analyse the impact of the generated news stories on readers and other participants in the ecosystem, the summative evaluation applied an expert judgement method. Novelty and usefulness are oft-used measures to evaluate creative ideas and products [Maher & Fisher 2011, Siangliulue et al. 2015], and human expert judgment is an effective source of these novelty and usefulness measures [Hollis & Maiden 2013].

Therefore, to generate the expert ratings of the news stories published with and without support from the INJECT tool, seven experts on the local public spheres were recruited. The seven experts were three associate professors of journalism or pedagogy at universities and university colleges, one head of information at a regional institution, one retired Norwegian language amanuensis, and two business people who ran a local travel company and a networking organization. All were inhabitants from villages and towns in one of the local public spheres for HO, HA and SU, and familiar with Norwegian local journalism in general. Five were considered experts on journalism, teaching and/or information work. Five were male, and two were female.

These seven experts independently rated selected news stories that journalists had written and published with support from INJECT and in the period 12 months earlier without support from INJECT. It was assumed that each expert would be able to rate up to 40 news stories accurately in each available 3-hour rating session, therefore a random number generator algorithm at random.org was used to select 20 news stories written with support from INJECT and 20 news stories written without it 12 months earlier. A number of articles proportionate with the total number of articles written by each journalist with the support of INJECT were selected randomly from the set. This procedure was re-

peated for the articles written without INJECT. Furthermore, to reduce bias caused by potential individual differences between journalist knowledge and levels of experience, these sets only included news stories that were written by journalists who wrote news stories in both periods. This was an important decision, because two of the journalists who wrote the largest number of stories with support from the INJECT tool were not present in their newspapers in the previous year, and hence were excluded from the analysis. The resulting 40 news stories were then randomly ordered in a questionnaire using another algorithm at random.org. Each news story was rendered anonymous by removing the newspaper and the journalist's name, then presented with two 1-7 scales to capture the perceived novelty and the value ratings of the news story. For example, the rating question for value associated with each news article was, in Norwegian: "*Kor verdifull er artikkelen for den lokale offentlegheita den er skriven for*?"

3.3 The Collected Qualitative Data

To analyse how the users perceived INJECT; researchers Lars Nyre and Balder Holm visited the three newspapers to collect qualitative data. A total of 15 journalists, editors and CEOs participated contributed to a subjective, colloquial and sometimes humoristic conversation about how they experienced INJECT as a part of their technical equipment. The conversation had four interrelated topics, and the interviewer first asked general questions, and then after a round of initial responses asked for more concrete details. For example, the section about creativity started with "What is creativity?" where hobby photography and novel writing were discussed alongside the journalistic context, and then the interviewer introduced went into the concrete contributions of INJECT to originality, surprise and novelty in their local journalist workflow. See appendix I for the Norwegian language interview guide.

- The four journalists from each of the newspapers were interviewed once each during a semi-structured focus group by a researcher from the University of Bergen.
- One focus group took place at each newspaper, at the end or after the evaluation period.
- The four topics discussed were *creativity*, *productivity*, *quality* and *technology*.
- Each focus group lasted approximately two hours.

Three semi-structured qualitative interviews were undertaken on an individual basis with six editors and general managers. Again, one interview took place at each of the three newspapers, at the end of or after the evaluation period. These interviews focused on how and to what extent the informants found that the use of INJECT strengthens the newspaper's competitiveness. Audio recordings of the interviews were transcribed in Norwegian and analysed for reporting in this summative evaluation.

The two focus groups with the journalists from HO and SU were transcribed in full and coded manually with pen and paper. The focus group with the journalists at HA and the six interviews with the editors and CEO were analysed based on notes taken during the interviews and playbacks from the interview recordings. Codification consisted of reading carefully for three topics: individual creativity as a local journalist, productivity as an individual and as part of a group, and competitiveness for the newspaper as a media business. These topics are further explained and analysed in the appropriate section in the analysis. and marking possible quotes for further analysis and interpretation. The quotes and paraphrases in this deliverable were selected for their clarity and representativeness in the material.

4 INJECT Summative Evaluation Results

All 12 journalists in three newspapers received INJECT training and helpdesk support during the two months of the evaluation period. INJECT was used in all three newsrooms during the evaluation period, and no major technical problems were reported. A total of 72 published stories were written with the support of INJECT by 10 of the 12 journalists. Two examples of published news articles that were written with the support of INJECT are shown in Figure 3.

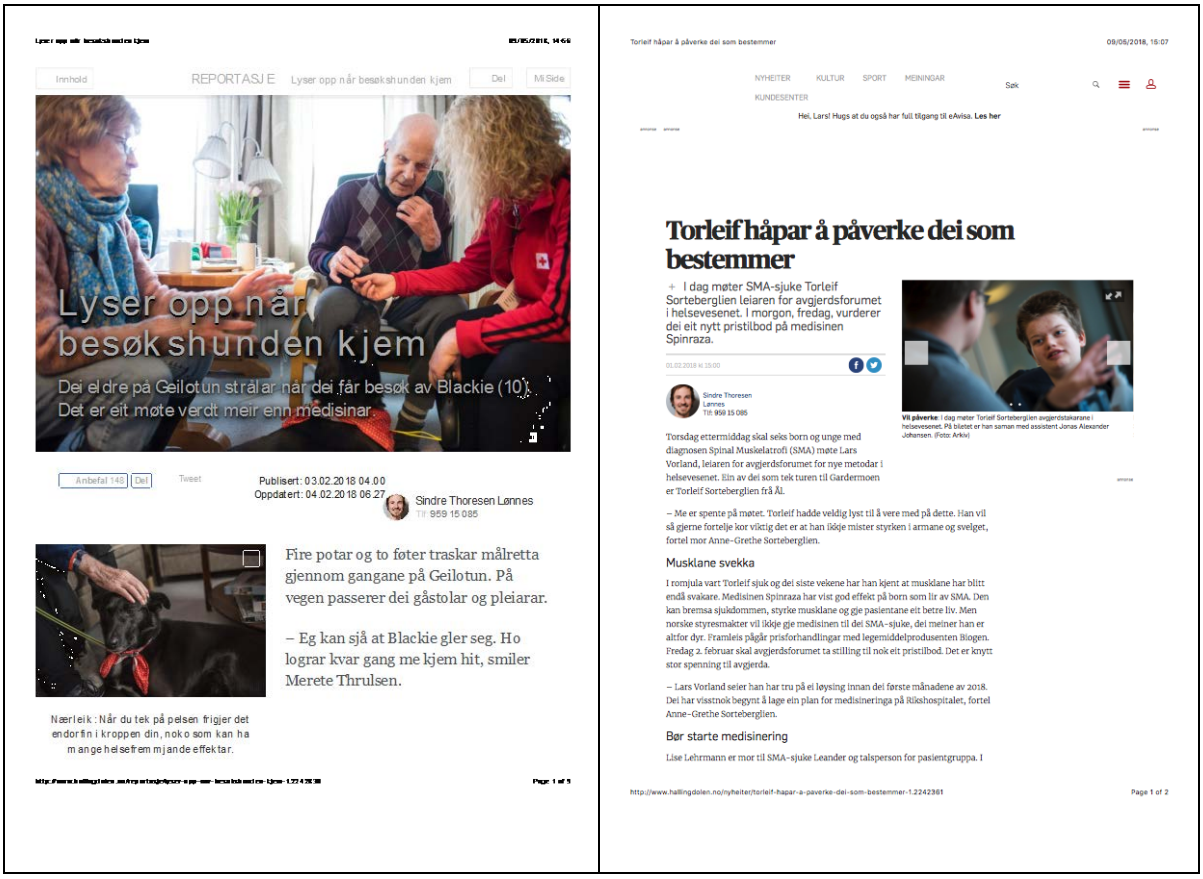

Figure 3: Examples of two published news stories that were written with support from INJECT

In this section we discus the use of INJECT in the newsrooms. First, an overall pattern of use is outlined, feedback on an expert ratings of sample news articles, individual use, analysis of the articles and productivity are reported.

4.1 Overall Patterns of INJECT Use across the three Newsrooms

The differences between the volumes of INJECT use to support the writing of news articles in the three newsrooms could be explained by the specific patterns of INJECT use in the three newsrooms. The four journalists in HO produced a total of 41 news articles with support from INJECT, the four journalists in

HA 18 news articles, and the four journalists in SU only 13 news articles. Two of the 12 journalists did not use INJECT to support the writing of any news articles during the evaluation period. The journalist from HA that did not use it reported that the primary reason for this was a lack of time due to short deadlines and simultaneous tasks, leading to INJECT use dropping off the daily work agenda.

Use of the Cxense digital tool to filter all articles written by each of the 12 journalists revealed that use of INJECT to support the writing of news articles accounted for 41 of the 87 (47.1%) news articles written by the 4 journalists in HO, 18 of the 38 (47.4%) news articles written by the 4 journalists in HA, and 13 of the 80 (16.3%) news articles written by the 4 journalists in SU. This data revealed that the three newsrooms did not require high levels of productivity from their journalists.

Furthermore, INJECT use within each newsroom varied by journalist, as described in the following table.

HO newspaper		**HA newspaper**		**SU newspaper**	
HO-1	5 news articles	HA-1	8 news articles	SU-1	7 news articles
HO-2	13 news articles	HA-2	0 news articles	SU-2	2 news articles
HO-3	11 news articles	HA-3	9 news articles	SU-3	0 news articles
HO-4	12 news articles	HA-4	1 news article	SU-4	4 news articles

Table 2: INJECT use in the three Norwegian newsrooms

The uses of INJECT in the three newsrooms was investigated more closely. All four journalists in HO wrote news articles with support from INJECT, and three of these four wrote, on average, more than one article per week with INJECT's support over the evaluation period. These four journalists were young, female, collaborated well and supported each other to explore and to use INJECT. All four were aged in the 20s, relatively newly employed, and may have been more responsive to undertaking new tasks than seasoned journalists. All four also appeared to be open to the use of new technologies in the workplace. However, these four journalists, because of their level, were also the journalists who wrote the fewest feature stories in the newspaper. These feature stories, portraits and longer analytic stories that could benefit most from support from INJECT were typically written by the male senior journalists who tend to be less interested in new digital tools.

During the focus groups, conducted at the end of the evaluation period, the journalists were clear about what creativity meant in their jobs. The most important thing is to discover "*Different approaches and angles on familiar things, to come up with something original; something that doesn't*

necessarily lie right there in front of you". These reported perspectives on creative thinking aligned with INJECT's use of digital creativity support for discovering new angles on news stories. Moreover, in local journalism, calendar news that occurred regularly through the year. The journalists reported that it was important to "*find new ways to write about frequent topics*" for calendar news. There is general agreement that INJECT could help the journalists to discover new angles on calendar events.

However, several individuals point out that the most creative activities typically took place outside the newsroom. For example, one reported that, "*I wrote about drug addiction in Stord, and I hung out for a whole day in a billiard hall just to get on a speaking basis with people, and I remember I thought this was very creative*". Some of the journalists reported the belief that the digital tools will only get them this far in local journalism, and journalists would still have to talk to people, call them on the phone, look through documents, etc.

In contrast, the four journalists at SU were male, and all had a more established approach to writing news articles. All were seasoned journalists, with 10-15 years of experience. All of them worked mainly with hard news, breaking news, and saw little use for INJECT. During the focus group one reported: "*We are the same generation of middle aged men who have worked here about the same length of time. The culture that was here when we came in has been upheld and recreated by us, so that it still exists*". However, there is a certain regret about this situation. "*We must try to be nicer than the guys who were here when we came, and try to support the young* ..". In hindsight, the SU journalists perceived that different journalists from the newsroom could have been asked to evaluate the INJECT tool. There was also evidence that the introduction of the INJECT tool was considered to be disruptive. When asked in the focus group about the last time a new digital tool in their journalism work was adopted, one replied, albeit sarcastically: "*Paint in 1992*". Another answered Google for searches and a video editing software that he has to use: "*If we get a new publication system you will be fired if you don't start using it. There is no choice*". The willingness in the journalists to take up new technological tools was low: "*We seem to have certain stubbornness against using INJECT and other tools like it. We don't learn to use new data programs voluntarily, and especially not programs that don't work optimally when we start using it*".

The four journalists at the HA newspaper were three male journalists and one female journalist. Again, like in SU, all were seasoned professionals. One of the journalists was a specialist in desk news writing, one was a photojournalist, and the other two were news journalists. Again, the journalist who had participated in the earlier co-design and formative evaluation meetings was among the most active, probably with a better understanding of what the project required.

Furthermore, in all three newspapers, there was evidence for the impact of some super-users on the use of the INJECT tool by their colleagues. Prior to the start of the evaluation, at least one of the journalists in each of the newspapers had been a primary stakeholder in the co-design and the formative evaluation of earlier versions of the INJECT tool, and across the three newsrooms, it was these super-user journalists who were among the most frequent users of INJECT. The focus groups provided some evidence that both the editors and other journalists in the three newspapers trusted these super-users to drive and encourage INJECT use in the three newsrooms. However, there is also evidence that this emergent structure might have placed too much responsibility on these few super-users. The super-user journalist at the HO newspaper had worked at the organisation for six months when she was given the responsibility to participate in INJECT's co-design work. She did not feel she was the right person compared to older and more experienced colleagues. Instead of selecting their most experienced journalists, the newspapers selected the less experienced ones. One of the other journalists at HO reported that, "*I was completely fresh here. I started on January 18th, and you had already started testing. I was really just thrown into it from day one*".

The role of the newspaper leadership was also important. The role of the leader was quite similar in the three newsrooms in that leadership was not very strongly involved in making the journalists use INJECT. None of the editors used INJECT themselves, for various reasons that all related to their busy lifestyle as editors, and the fact that designated journalists were given this role anyway. In two of the newspapers the editor was only sporadically involved in INJECT project management. One consequence was that the designated super-user in each of the three newspapers remained the most active INJECT user throughout the period, and fulfilled various INJECT leadership activities within the newsroom.

However, qualitative comments from the focus groups revealed that there was a neutral or negative sense that use of the INJECT tool was a chore rather than an opportunity for most of the journalists, and hinted at wider climate issues in the newsrooms. Most of the journalists were required to spend much of their time writing hard news stories at that time that these stories were occurring.

To conclude, the use of INJECT to support the writing of the news stories varied by newspaper. Factors that influenced the frequency and nature of the use of INJECT included the newsroom climate, the openness of the journalists to explore new digital technologies, and the informal structures that emerged to encourage and support the use of INJECT.

4.2 Types of Article written with and without INJECT Support

An analysis of the 72 news articles written with the support of INJECT was undertaken. Each news article was categorized using a simple taxonomy of article types. The totals of types of article written with the support of INJECT are reported in Table 6.

Article type	**Hordaland (HO)**	**Hallingdølen (HA)**	**Sunnhordland (SU)**	**Total**
Crime	2	0	0	**2**
Culture	11	5	6	**22**
Politics	1	0	0	**1**
Social issues	22	11	2	**35**
Other	5	2	5	**12**
Total	**41**	**18**	**13**	**72**

Table 3: Total types of articles written with and without INJECT

Almost half of news articles written with INJECT were about social topics, and almost another third of the news articles were about cultural topics. In contrast, low numbers of news articles about politics, crime and other topics that were written with the support of INJECT.

Qualitative comments reported during the focus groups and the interviews provided some evidence for the types of article that INJECT was used to support the writing of. The INJECT tool was reported to provide effective support for writing research-based journalism, reported in the form of features, portraits and other long form genres. One journalist at the SU newspaper reported: "*For our everyday news we always have too many stories already. But during the magazine meetings, we are required to come up with ideas from scratch, and ideally it should be something we haven't written about before. So there we really need to be creative, and INJECT can be useful*". Another said that their colleague who works with content marketing could benefit from INJECT. She is supposed to write about "*interior decoration*" or "*hotel interiors*". The implication is that she has to start entirely from scratch when new commercial clients contact her, and this is when you really need a creativity tool. Another journalist reported a need for INJECT 4 times a year, in relation to each of the four magazines for spring, summer, autumn and winter. In these magazines there was reported to be space for feature stories, long-form, where careful building of angles was more realistic.

However, some of the journalists also highlighted the limits of creativity and creative thinking in their work. They reported little need for much creativity to do their job as news journalists. Instead, other qualities were regarded as more important – qualities such as writing good news copy, having good press photos, being well prepared before going out to do interviews, and having good routines and procedures: "*For me it is important to get things done efficiently. This is the industry part of being a journalist. If it has to be done in a special way because somebody expects it, well then I won't use my brain cells and capacity on being creative about it*". Such feedback was not presented as a critique of the INJECT tool, but as a report of the work priorities in the three regional newspapers.

One potential threat to the discovered association between the use of INJECT to support news article writing and the novelty ratings of the resulting article was an association with article types. In simple terms, because the journalists selected to use INJECT to support the writing of news stories of certain types, it was possible that the significant difference in the novelty ratings was due to article type, rather than use of the INJECT tool. However, an analysis of the average novelty ratings by article type revealed no evidence of this threat to the validity of this conclusion. Looking at the average novelty ratings per type for different types of news article with support from and without support from INJECT:

- Articles about social issues: average novelty rating of 3.71 with INJECT support, 3.05 without INJECT support;
- Articles about culture: average novelty rating of 3.76 with INJECT support, 2.86 without INJECT support;
- Articles about other topics: average novelty rating of 2.96 with INJECT support, 2.21 without INJECT support.

These results revealed that average ratings of new news articles that were written without support from INJECT were lower in each of the types.

We also looked at the types of the 40 articles that were analysed. The results are reported in Table 7. This analysis revealed that the subset of the news articles (by feature type) written with support from INJECT were broadly representative of the types of article in the full set of articles written without the support of INJECT by the four journalists in each newsroom.

	With support from INJECT		**Without support from INJECT**	
Social issue	9	45%	6	30%
Culture	7	35%	4	20%

	With support from INJECT		Without support from INJECT	
Economy	0	0%	1	5%
Politics	0	0%	1	5%
Crime	0	0%	6	30%
Other	4	20%	2	10%

Table 4: Article feature types with and without support from INJECT

However, a comparison of the percentages of the types of news article written with the support of INJECT to judgements about the types of news article written in the three newspapers over time by the three editors of the newspapers, revealed a bigger picture. These judgements, to the nearest 5%, are reported in Table 8.

	With INJECT support	In HO newspaper	In HA newspaper	In SU newspaper
Social issue	45%	20%	5%	15%
Culture	35%	20%	15%	10%
Economy	0%	5%	5%	10%
Politics	0%	20%	20%	20%
Crime	0%	5%	10%	5%
Other	20%	30%	45%	40%

Table 5: Article feature types with support from INJECT per newspaper

This albeit simple analysis revealed that, compared to editor judgements about the types of news article that are written and published in the 3 newspapers, the types of article that were written with the support of INJECT aligned more with the types of news articles written in the HO newspaper. In contrast when compared with the types of news article written with the HA and SU newspapers.

To conclude, the use of INJECT was associated with an increase in the novelty of news articles written by journalists in two of the three newspapers about social, cultural and some other specific types of articles, but not about more general forms of news stories. The HO newspaper was perceived to publish more of these types of article, and its journalists used INJECT's support to write more news articles

than did the journalists in the other two newspapers. The different balance of types of news article in the two data sets does not appear to have biased or introduced a new threat to the result of the expert rating analysis. This is an important and positive conclusion.

4.3 Analysis of Expert Ratings of Sample News Articles

To investigate whether the support to journalists from INJECT was associated with an increase in the ratings of creativity of the news articles, that resulted from that support, compared to news articles that were written without that support. We investigated the expert ratings of: (1) the **value** and (2) the **novelty** of the sample of the 40 news articles written with and without support from INJECT.

There was no significant difference in the ratings of the **value** of news articles written with and without INJECT. A Mann-Whitney test revealed that the **value** ratings were not greater for the news articles written with the support of INJECT (Mdn=5) than without the support of INJECT (Mdn=5), $U=9156$, $p>0.05$. The average value rating of all of the news articles was 4.7 out of 7. The lowest and highest average value-rated articles were 3.71 and 5.86, indicating that the articles were rated as having neither high value nor little value.

This result was unsurprising, given that all of the news articles had been published, and therefore passed through each newspaper's editorial process. For example, at the HO newspaper the online news articles were published continuously and read and checked by the editor either hours or sometimes days after online publication, but before publication in the paper edition. If the journalist has any doubts about the case or an interview, he or she had to speak with the editor before publication. At the HA newspaper, when the journalist completed a news article, the article was submitted to a quality control process by the news desk before publication in both paper and online editions. Only during weekends and exceptional circumstances would the journalist perform quality control. And at the SU newspaper, the journalists fed the news articles into the content management system for automatic publication, first in the paper edition then in the online one. Only if the news article was deemed to be problematic by the journalist was it discussed with the newsroom leader before publication. As such, there were no strong reasons to expect variations in the already-acceptable quality and value of news articles written with and without the support of INJECT.

In contrast, the ratings of the **novelty** of news articles written with INJECT were significantly higher than of the new articles written without INJECT. A Mann-Whitney test revealed that the **novelty** ratings were greater for the news articles written with the support of INJECT (Mdn=3) than without the support of INJECT (Mdn=2), $U=6997.5$, $p<0.0001$. INJECT use was associated with an increase on the novelty of news articles. More specifically, INJECT use was associated with an increase from low average

ratings that indicated that most of the news articles were between '*not novel*' and '*medium novel*', to average ratings that to indicated at least medium levels of novelty.

Significant, it was found that the 20 news articles written with INJECT contained more words than the 20 news articles written without INJECT. An unpaired t-test revealed a significant difference in the numbers of words written to describe news article with the support from INJECT (Mdn=652, SD=393) and without support from INJECT (Mdn=414, SD=211) conditions, t= 2.08427, $p<0.05$.

Furthermore, there were differences between the expert ratings of news articles written in the different newspapers. Unsurprisingly there were no significant differences in the ratings of the **value** of news articles written with and without INJECT in each newspaper. However, the ratings of the **novelty** of news articles written with INJECT in the HO and HA newspapers were significantly higher than of the new articles written without INJECT. For the news articles written by the HO journalists, a Mann-Whitney test revealed that the **novelty** ratings were greater for the news articles written with the support of INJECT (Mdn=4) than without the support of INJECT (Mdn=2), U=700, $p<0.0005$. INJECT use was associated with an increase on the novelty of news articles written for the HO newspaper. Likewise, for the news articles written by the HA journalists, a Mann-Whitney test revealed that the **novelty** ratings were greater for the news articles written with the support of INJECT (Mdn=3) than without the support of INJECT (Mdn=2), U=792, $p<0.005$. INJECT use was also associated with an increase on the novelty of news articles written for the HA newspaper. However, this was not the case for the SU newspaper. A Mann-Whitney test revealed that the **novelty** ratings were not greater for the news articles written with the support of INJECT (Mdn=3) than without the support of INJECT (Mdn=2), U=843, $p>0.05$.

In conclusion the INJECT tool, when used to support the writing of news articles, was associated with an increase in the novelty of news articles in two of the three newspapers.

4.4 How Journalists Reported using INJECT

The ten journalists who used INJECT to support the writing of news articles provided more detailed ratings of 69 of the 72 news articles using the digital log, and entries for these 69 news articles were examined further. Interpretation of data used ratings 3, 4 and 5 as satisfactory or more, and 1 and 2 are noted as unsatisfactory.

INJECT's support for the task rated by journalists as satisfactory in just over half of all news articles (37 out of 69) written by each journalist with support of the tool. There was greater satisfaction with INJECT's support for writing news articles on social issues where the support was rated as satisfactory or higher for 24 of the 35 news articles published. In contrast, it was rated as less than satisfactory for 13

of the 21 news articles on cultural issues. To conclude, the journalists rated INJECT support as more effective for writing news articles on social issues (feature articles).

Journalist satisfaction with INJECT's support for writing news stories was mapped to journalist satisfaction with the resulting news story. The ten journalists were satisfied with both INJECT support for writing the news article and the resulting article for 37 of the 69 news articles published. INJECT's support was rated as satisfactory or above for all nine news articles that were rated as very satisfactory. When the journalists rated the support from INJECT as satisfactory or above no journalist was unsatisfied with the resulting news article. In contrast, satisfaction with INJECT support was not necessary to produce news articles that journalists considered satisfactory. A total of 31 news articles rated as satisfactory were produced with INJECT support that was rated as unsatisfactory, providing some support for journalist claims that digital tools such as INJECT are perceived as add-ons to journalist work, rather than being core to it.

To conclude: the journalist ratings revealed evidence of greater satisfaction with INJECT support and greater satisfaction with the resulting article, this was found especially so for articles they rated very satisfying, but not for all news articles that were written.

In the digital log each journalist had documented the forms of INJECT support for writing each news article using one or more qualitative comments. Therefore, these qualitative comments were analysed and categorized as: (1) support that led to the journalist generating new information about the article that either shaped the angle and/or was included directly in the article. (2) Support that did not lead the journalist to generate new information about the article, in spite of INJECT use during the article writing (this includes information that was discovered but not new to the journalist) and (3) a comment that could not be attributed to (1) or (2). The results are reported in Table 2. The journalists provided no comment in the digital log for 8 of the 72 news articles, and most of these news articles – 7 – were amongst the first 15 that were produced with INJECT's support, suggesting a problem with the regular use of the log during the first weeks of the evaluation period.

	Support for new information	**No support for new information**	**Other comments**	**No comment**
Total of news articles	34	25	5	8

Table 6: Numbers of news articles about which the journalist reported INJECT support, no INJECT support and other comments in the digital log

For the remaining 6, (putting aside the 8 no comment) news stories over half – 34 – reported evidence for support that had led to the journalist generating new information about the article that either

shaped the angle and/or was included directly in the article. These 34 log entries provided evidence of different forms of INJECT support that are summarised in Table 3, and translated from the original Norwegian.

Support type	**Example digital log entries**
New angles on news articles	I searched for earlier issues about UKM, and received some information and inspiration for how to angle the case; The idea for the article came from a tip [creativity spark]. I used INJECT to find exciting ideas about how I could approach the case. But I did not find anything useful; Find some angles, ideas.
New insights and inspiration	Got insight into the extent of refurbishment; Got some inspiration for what others wrote about the "Utøya 22. July" film by Poppe; I found inspiration for a slightly better title than I had originally; I needed inspiration for more possible titles, and found it.
New sources of information	It helped me with input (more sources) to the article. The idea of the matter came from tips [creativity sparks]; INJECT did not help me with the idea. But it gave me some sources; INJECT helped me see other things that were written about Ingrid Brandseth.
Background information and facts	Helped me with facts; It gave me a new source and a lot of background information and facts. INJECT actually gave me more stuff than I needed, so the rest will be saved for the next occasion; I found articles with background info relevant to the case, suitable from internal archives; Background info about the "Viking" series;

Support type	**Example digital log entries**
	Did not help the idea, but I would write about neighbors who are critical of a new biogas plant, I searched for biogas in INJECT, and picked up more relevant articles, both news articles and research material. Directly to this case, I did not use enough of it, but there are some background information, and it is natural for new follow-ups to look closer at what has happened to other places before.
A new section of the article	Received feedback about the problem based on a few reports in the National Newspapers (Dagbladet) on urban issues. Resulted in a section of my case; I found more information about the Pupil Study, and used it to create a fact box.
Research inputs	Received input for research that was also used directly in article.
Other articles on the same theme to read	Could read more other articles on the same theme; This is an article about UKM. INJECT showed me how other journalists have written about the event earlier.

Table 7: Examples of qualitative comments entered by the journalists into the digital log to describe how INJECT supported their writing of news stories, grouped according to themes

The log entries revealed a complex pattern of digital support for the journalists. Not only had the journalists used INJECT to discover new angles on news articles to be written, for example from creativity sparks, but also the journalists used INJECT indirectly to discover other information sources that might have supported the discovery of new angles. Furthermore, the INJECT tool appeared to fulfil other roles that contributed to new information that was included in the news articles, e.g. fact boxes and sections of news articles. As such, the INJECT tool was used to support the writing of news articles in ways that had not been designed for, as well as in ways that had been designed for. During the focus group, the HO journalists agreed that it was sometimes difficult to know where the inspiration comes from: "*Ideas can pop up everywhere. Was it INJECT, or did I see it on Facebook?*" However, to conclude, the INJECT tool was reported to support the journalists in different ways during story writing and development, and these different ways appeared to contribute to the tool's overall effectiveness.

In contrast, the journalists reported that, during the writing of 25 news articles INJECT did not support the development of these. It was possible to cluster the log entries for these 25 articles under different themes, which are summarised in Table 4, again translated from the original Norwegian.

Issue type	**Example digital log entries**
Non-specific issue	No; In no way; Quite honestly, not so much.
INJECT did not return useful information	Did not get any relevant hits. No help; Did not help, did not find what I was looking for; Not very much. Checked up in the word kibbutz, without finding any good examples.
Lack of new information for inspiration support	The case had been in the media for 4-5 years, so I searched around to find out what was written about the matter at that time. Unfortunately, it did not show up very much that gave me inspiration to the case, but I tried a little in the research phase; Unfortunately, I did not get enough that caused me to get the idea from INJECT, but I looked at what was written about Kari Traa clothes before; INJECT did not help me with the idea, but I checked out things that were earlier on the subject; I had the idea from before; Gave me an understanding that the most of angles to Norwegian newspapers is on the negative side of gaming instead of positive aspects, which there are many of. But I was not very inspired to make changes to my article; Did not help me. Was looking for inspiration for a new title or angle, but did not think it was anything fitting.

Table 8: Examples of qualitative comments entered by the journalists into the digital log to describe how INJECT did not support their writing of news stories, grouped according to themes

Many of the log entries in Table 4 provided very little rationale or explanation for the lack of support. However, some of the entries allowed us to two themes – a perceived failure by INJECT to return information of use in response to the topic terms that the journalist entered, and lack of creativity support provided by the information that was returned. The first theme implied possible different technical limitations of the INJECT tool, such as poor indexing of available Norwegian news information, poor parsing and sense-making of Norwegian language terms, and/or non-optimised parameter settings for the requested creative guidance.

The second theme was more interesting, and revealed that we need to pay closer attention to the specific context in which digital creativity tools could be of support. The theme hinted that an artificial intelligence algorithm cannot always outperform a practicing professional journalist and generate new angles that the journalist has not identified previously. That said, even if the journalist did not use INJECT's explicit creative guidance, as the log comments state in response to the question asked, there are some interesting and unanswered questions about the potential effect of, for example, reinforcing an angle on a news story that the journalist had already identified. More research will be needed to investigate the indirect effects on the creativity of journalists.

Furthermore, during the focus groups at the end of the evaluation period, some of the journalists reported that creative thinking with INJECT's support was enjoyable. Others reported valuing the higher reflexive level resulting from the INJECT involvement, and the tool fulfilled the basic function of supporting creative thinking in search for good news angles. In this, the journalists revealed instances where INJECT released their creativity, and that these experiences were enjoyable. "*It has been very interesting to take part in INJECT, and I would do it again*", reported one journalist.

During the focus groups, some of the journalists also reported that INJECT worked in a way that both replaced and enhanced the need to go into the internal archive or using Atext or other news aggregators. One of the journalists from the HO newspaper reported: "*I have used INJECT to check if others have written about the same topic or about something that happens locally now. Although I don't necessarily feel creative, I can look at how they wrote or collected information, how they have illustrated the story, and more. I could also have used the internal archive, but sometimes INJECT gave me good alternatives from current news mixed with archive materials*". These comments revealed that INJECT had the potential not only to support creative thinking about news angles, but also to facilitate access to existing news sources that journalists use for other purposes, with implications for improving journalist productivity as well as creativity.

4.5 INJECT Usability Issues and their Impacts

As reported, all 12 journalists used INJECT during the evaluation period, and ten used it to support the writing of news stories that were published. Overall, no major usability problems or critical failures with the INJECT tool were reported. However, there were still usability issues that were claimed to impact on INJECT's use. These issues were particularly important due the first uses of INJECT, when the expectations and norms of tool use for the journalists were being set. Alas, one perceived usability problem was uncovered during these initial periods. Some journalists complained of technical limitations such not receiving any creative guidance in response to the topic terms that were entered, which led them to stop using INJECT for the task – a comment also made in the digital log comments reported in Section 4.2.

A journalist reported that if INJECT had been integrated as originally planned as a toolbar in the Adobe InCopy text editor, it might have been easier to remember and to use. This journalist was also assigned to report on wildlife management and chronic wasting diseases – topics that she reported little creativity support from INJECT for. Indeed, INJECT often used her own previous articles retrieved from the local archive to support creative thinking. Therefore, the journalist concluded by reporting that the work could not benefit from the use of the INJECT tool. For the other journalist who did not use INJECT, the CEO of SU reported that this journalist was a substitute who was frequently in and out of the office and during the evaluation period mostly absent.

In particular, the two journalists who did not use INJECT's support to write any news articles reported receiving new creative guidance in response to common words that they would expect to receive guidance. One example term was *Fretex*, which is an outlet for used items. These experiences resulted in a loss of motivation to continue to INJECT through the evaluation period.

Furthermore, during the focus groups, some of the journalists reported that data tools were, in general, considered cumbersome to adopt and use regularly – a consideration that affected the adoption of these types of tool. In contrast, one reported that the introduction of a new professional camera was a more engaging and fun technology to start to use.

4.6 The Most Novel News Articles written with INJECT

A total of seven of the 40 news articles rated by the experts were given a median rating of four or more out of seven, which mapped to "more than medium novelty". Six of these news articles were written with the support of INJECT, and one without the support of INJECT. Of the six news articles written with the support of INJECT, three were written by HO journalists and three were written by HA journalists. The one news article written without the support of INJECT was also written by a HO journalist.

For the six articles written with INJECT, there is evidence of the impact of the super-user journalists. All three of the HO articles were written by the same HO-4 journalist, who wrote a total of 12 articles with INJECT. Likewise, two of the three HA articles were written by the same HA-1 journalist, who wrote a total of eight articles with INJECT.

Article	Description
009ha	The very best career choice almost: Guaranteed will give you work in Hallingdal. An article about providing future skills to the population
002ha	There was no radio after DAB came: Ola Lien has shop for radio equipment 15,000 kroner to the right radio after that DAB replace FM. But in Lio it is internet radio that may exist, to support people such as farmers.
004ha	Fearing to stand without taxi rank in the district: Taxis in the district fear free competition will outreach the small ones taxi drivers in the district. A successful campaign to stop de-regulation of the local taxis market.
016ho	I have been skiing all night after jol anyway. The blue colour of the sky is darker and darker, starred Gemini is advocating. An article about night skiing.
024ho	An article about bringing jazz music into schools for younger people.
035ho	An article written about what children want to be when they grow up.

Table 9: The subjects of the more novel articles written

4.7 Summary of Journalist Feedback

The 10 journalists who used INJECT to support the writing of news articles provided more detailed ratings of 69 of the 72 news articles using the digital log, and entries for these 69 news articles were examined further. Interpretation of data used ratings 3, 4 and 5 as satisfactory or more, and 1 and 2 are noted as unsatisfactory.

INJECT's support for the task rated by journalists as satisfactory in just over half of all news articles (37 out of 69) written by each journalist with support of the tool. There was greater satisfaction with INJECT's support for writing news articles on social issues where the support was rated as satisfactory or higher for 24 of the 35 news articles published. In contrast, it was rated as less than satisfactory for 13

of the 21 news articles on cultural issues. To conclude, the journalists rated INJECT support as more effective for writing news articles on social issues.

Moreover, journalist satisfaction with INJECT's support for writing news stories was mapped to journalist satisfaction with the resulting news story. The 10 journalists were satisfied with both INJECT support for writing the news article and the resulting article for 37 of the 69 news articles published. Furthermore, INJECT's support was rated as satisfactory or above for all nine news articles that were rated as very satisfactory. Furthermore, no journalist was unsatisfied with the resulting news article when the support from INJECT was rated as satisfactory. In contrast, satisfaction with INJECT support was not necessary to produce news articles that journalists considered satisfactory. A total of 31 news articles rated as satisfactory were produced with INJECT support that was rated as unsatisfactory, providing some support for journalist claims that digital tools such as INJECT as perceived as add-ons to journalist work, rather than being core to it.

To conclude the journalist ratings revealed evidence of greater satisfaction with INJECT support and greater satisfaction with resulting article, especially for very satisfying articles, but not for all news articles that were written.

4.8 INJECT Support for Journalist Productivity

To answer research question RQ2, INJECT's support for journalist productivity – the time and effort needed to produce each news story – was investigated primarily through qualitative rather than quantitative data, due to a lack of data about the time and resources about journalist work practices that were available from the three newspapers prior to the introduction of INJECT.

Some of the collected data corroborated that used INJECT contributed to rather than impeded journalist productivity. In particular, the feedback from the focus groups revealed that some of the journalists used INJECT in a way that both replaced and enhanced the need to go into the internal archive or using *Atext* or other news aggregators. INJECT had the potential not only to support creative thinking about news angles, but also to facilitate access to existing news sources that journalists use for other purposes. However, further development work would be needed to evolve INJECT into a one-stop shop for different accesses and uses to different data sources. Furthermore, the focus groups revealed little overall evidence that INJECT was impeding their daily work practices, or even rendering the journalists less productive than before the tool's introduction.

Furthermore, in the focus group, the journalists from the HO newspaper identified different themes and opportunities for productivity gains associated with use of the INJECT tool. One of the journalists defined productivity as taking the initiative: "*To come up with ideas and angles that end up becoming*

*stories. It is important to contribute, and not just get the jobs handed out to you. Productivity is what brings good stories to the newspape*r" Asked if use of the INJECT tool had contributed to this form of productivity, the journalists answered: "*Yes, it could happen that we got new ideas for a certain type of story by using INJECT*" and: *"Yes, a new idea for an angle, a title, a good photo caption, and such things. It depends on how your creativity works*". Another of the journalists reported: "*Productivity is looking for the right things when you are out on an assignment, and not spend too much time on it. This relates to how well prepared you are*". The journalists also reported that use of the INJECT tool provided support for succinct news writing, which in turn might have increased productivity, for example: "*If I have used INJECT during research, and read other news stories relating to the same topic, I will know what questions the others have asked, and what typically is being answered. This can help me to formulate the exactly right question, and this is a type of productivity in relation to an assignment*".

Nonetheless, the HO journalists did also agree that INJECT use did not make them more efficient at writing news articles: "*No, because it takes time to use INJECT. It takes away time that we could have spent on writing the story*". The HO journalists then contrasted the INJECT tool with types of digital tool that might increase their efficiency: "*Template based news writing*", although this was not popular with the journalists. HO was implementing a new system in which page-geometry, fixed sizes and templates will determine to some degree what journalists should write: "*You can write a certain number of characters and have two pictures, and that's all*", and "*It's very simple, and will probably make us more efficient*".

However, other evaluation data provided preliminary evidence that use of the INJECT tool did not contribute to their productivity. At the start of the evaluation, one journalist decided not to use the tool to support the writing of news stories due to the lack of obvious productivity support. This journalist cited a lack of time due to short deadlines and simultaneous tasks, leading to INJECT use dropping off the daily work agenda. This journalist reported that if INJECT had been integrated as originally planned as a toolbar in the Adobe InCopy text editor, it might have been easier to remember and to use. This barrier to increased productivity was reinforced during the focus group with all of the HA journalists. Likewise, the focus groups revealed evidence that some of the reported usability problems impeded regular and hence productive use of INJECT.

Other qualitative comments from the focus groups revealed that there was a neutral or negative sense that use of the INJECT tool was a chore rather than an opportunity for most of the journalists, and hinted at wider climate issues in the newsrooms. Most of the journalists were required to spend much of their time writing hard news stories at that time that these stories were occurring.

The journalists' relatively low ratings of INJECT's support in the digital log might have been associated with journalist expectations for increased productivity. As reported, previous studies in other newsrooms had revealed that some journalists had expected the tool not only to support them to discover new news angles but also to retrieve all relevant information with which to complete a news story with that angle [Maiden et al. 2018]. Therefore, if the INJECT tool is to fulfil the role of a one-stop support hub for journalists, it will be required to be more connected to different information sources, and to provide more diverse support for journalist creativity with this information.

Both the types of news stories that were written with INJECT's support and the feedback from the journalist focus groups also reported evidence that INJECT was not used to increase journalist productivity for the majority of news stories written in regional newsrooms. Instead, the INJECT tool provided more effective support for writing research-based journalism in the form of features, portraits and other long form genres, such as for each of the four magazines for spring, summer, autumn and winter that allowed time and space for feature stories, long-form, where careful building of angles was more realistic. The journalists who had used INJECT had still been under pressure to be productive and write hard news with frequent updates, and did not see INJECT as a technology that would increase their productivity, but rather one that would increase the quality of their journalism and even require more time by the journalist. For example, as reported previously, the journalists at the SU newspaper worked under high pressure to produce news articles, and perceived productivity as efficiency and doing the same work as before more quickly. Their journalists reported that they could not become more efficient with tool designed to support their creative thinking: "*The way our newspaper is run, INJECT is a tool that increases the time spent writing an article. Maybe we could get better stories if we cultivated just the right functions and drilled all journalists until they used it*".

There was also evidence that at least some of the journalists had a narrow view of the INJECT tool's capabilities and the contexts in which it could be applied – a view that limited the productivity support that the tool could have provided. Some reported in the focus groups that creative activities take place outside the newsroom, and that deskbound digital tools are limited for local journalism. The journalists will still have to talk to people, call them on the phone and review documents. However, there is no evidence that the 12 journalists in the evaluation used INJECT to prepare for field visits or interviews – uses of INJECT reported by other journalists outside of the three regional newspapers. The web application version of INJECT was responsive to different mobile device browsers, and could be used with the same functionality outside of the newsroom.

To conclude, the evaluation revealed the potential for use of the INJECT tool to improve the productivity of journalists, although not through direct creativity support for the journalists. Instead, feedback revealed the potential for a single tool or service to improve both the creativity and productivity of

journalists, by combining functions for automated referencing, accessing information sources and news aggregators. However, more INJECT tool development will needed to produce these capabilities. Moreover, INJECT's use and potential productivity gains appeared to be very sensitive to perceived and actual usability problems, the effectiveness of the technical features, the tool's fit to the individual journalist's work roles, tasks and locations, and the diverse support structures in the newsroom. As such, delivering improvements to journalist productivity is a more complex, multi-faceted problem, and the current INJECT tool offers only a part of the required solution.

4.9 Newsroom Competitiveness

Due to the limited duration of the summative evaluation, it was difficult to collect sufficient data from the newsrooms about the impact of improved journalist productivity or increased news article creativity in the two of the three newsrooms to undertake a substantial quantitative analysis. Therefore, the interviews with the newspaper CEOs and editors was held and the transcripts analysed to develop tentative conclusions about possible impacts of the INJECT tool use on newsroom competitiveness. In each of the three newspapers either the editor or the CEO led the INJECT introduction and evaluation, with the person fulfilling the other role in a background role.

At HO, the editor was a strong supporter of traditional journalism, during which sources in the local community are confronted face-to-face and journalists use their personal knowledge of the area for their journalism. He argued strongly that, apart from upgrading subscription services and such basic upgrades, local journalism had little to gain from the support of digital technologies such as INJECT. Furthermore, he was not focused on long term planning in the newspaper, and had not prioritised the uptake of INJECT within the newsroom. In contrast, the CEO at HO was more positive and expressed a desire for continued INJECT development. With more effective integration into the work tools of the HO newsroom, he reported that he could see the value of INJECT, leading to better journalism as a competitive advantage for the newspaper. However, in spite of the positive comments about the potential of the INJECT tool, he was unable to report any concrete evidence of gains in productivity or competitiveness from the evaluation. Regarding the potential competitive advantage, he reported that the pricing of the INJECT was key and that initial prices reported in Deliverables D2.1 and D2.2 were not feasible for his newspaper.

At the HA newspaper, the editor was generally positive about the introduction of the INJECT tool but was unable to provide much insight about the possible impacts of this introduction on journalist productivity or newsroom competitiveness. The CEO reported that the INJECT project had been very well managed and addressed most the needs of the newspaper. He reported that he wished to see continued INJECT development. The integration of the tool with other technologies was less critical

than in the other two newspapers. Instead, pricing was key, and he commented that INJECT would need to be integrated into the core work of journalists to charge a high fee for it. More generally, he reported that the INJECT project had been an invaluable learning experience and essential to nurture an innovative mind-set within the newspaper. To conclude, he recognised the potential competitiveness of INJECT but was unable to report any concrete productivity or newsroom competitiveness gains during the evaluation period.

At the SU newspaper, the editor reported that INJECT was a poor fit for their newspaper because of their focus on hard news and short updates. Consequently, he was unable to report any competitive or productivity gains, and would prefer digital support to improve journalist efficiencies rather than creativity. By contrast, the CEO was more positive, and reported that competitive advantages of innovation were tied to a general belief in technological progress.

More generally, the leaders at both HO and HA stressed that the by-products of participating in the project – it was beneficial for each newspaper, its network of contacts, especially with the University of Bergen and Media City, and for staff to be part of an innovation initiative. The CEO of HO found the INJECT project to be a catalyst for the HSF-innovation cooperation involving the three newspapers.

To conclude, the interviews with the newspaper editors and CEOs revealed a mixed picture, but with few claims for the impact on the INJECT tool on newsroom competitiveness, at least in its current form. However, it was possible to extract four general heuristics about impact from the interview results and evaluation data reported elsewhere in this deliverable. (A) Newsroom competitiveness cannot be disassociated from the pricing of the INJECT tool to smaller newsrooms such as the three that participated in the evaluation. (B) Journalist creativity was not associated with journalist productivity in the interviews with the editors and the CEOs. (C) Leaders of a news organization need to be aligned with regard to the styles of journalism and types of digital technologies to introduce into their newsrooms. (D) More generally, the INJECT tool and its associated benefits need to be aligned with the types of news and news organisation that can benefit from the advantages that it affords.

5 Summary, Conclusions and Next Steps

This deliverable reports the results from the summative evaluation of a specialised version of the INJECT tool in use in three regional Norwegian newspapers over a two-month period in early 2018. Overall, the summative evaluation was a success, and revealed (A-M) that:

A. The INJECT tool was used by most of the journalists in their daily work, even if the version of it that was made available to the newsrooms was not the version that was optimized for the newsrooms by the INJECT team;

B. The INJECT tool was used to support the writing of 72 published news stories by 10 of the 12 participating journalists in the three newsrooms across the two-month period;

C. The INJECT tool was used by the journalists to different degrees in the different newsrooms, and the tool was used by the newsroom which was perceived by its editor to write the higher proportion of feature stories rather than hard news stories;

D. Journalist ratings of the tool's support for the writing of different news stories was often less than satisfactory;

E. However, greater use of the INJECT tool was associated with journalist willingness to investigate new work practices, openness to new technologies and management direction to use these technologies, and support from other journalists who were also using INJECT in each newsroom;

F. The INJECT tool was used more to write feature stories about social and cultural issues rather than hard news stories, and most journalists reported that INJECT's features were best suited to support the writing of feature articles;

G. Journalist use of the INJECT tool did not increase the perceived ratings values of news stories that were written with the support of the tool, but;

H. Journalist use of the INJECT tool did increase the perceived novelty ratings of news stories that were written with the support of the tool;

I. As a result, use of the INJECT tool did increase the rated creativity of news stories written with the support of the INJECT tool compared to without this support, however this increase was from low novelty ratings without the tool's support to medium novelty ratings with the tool's support;

J. The journalists who used the INJECT tool to support the writing of news stories that were rated as more novel reported using the tool not only to discover new angles on stories, but also to

discover other news stories on the same theme, to acquire research inputs, to discover new sources of information with which to write stories, to obtain background facts and information, to discover new insights about the story, and to develop new sections of the news story being written;

K. The journalists did encounter usability problems with the INJECT tool – problems often associated with limited or lacking creative guidance based on the topic terms that were entered;

L. Journalist use of the INJECT tool did not enhance their productivity. Not only did the journalists argue that other types of digital support, and not creativity support would be needed to increase their productivity levels, but also use of the INJECT tool was sometimes seen to require more journalist time;

M. There was too little evidence to conclude whether the adoption of the INJECT tool, on its own, contributes to any potential or real increase in the productivity of the three regional newsrooms, and the results revealed possible reasons for this in each of the newsrooms.

5.1 Research Questions Revisited

Therefore, returning to the three research questions set at the start of the summative evaluation:

RQ1: Journalist use of the INJECT tool did increase the creativity of the news stories produced with the support of the INJECT tool;

RQ2: But journalist use of the INJECT tool did not increase the productivity of the journalists to produce news stories with the support of the INJECT tool, and;

RQ3: Journalist use of the INJECT tool provide evidence that can improve the competitiveness of the newsrooms that used the INJECT tool.

5.2 Threats to Validity

Of course, the reported results used to answer these three research questions were subject to different threats to validity of different types. In this deliverable, we do not report a systematic review of these threats, but we do highlight and discuss threats related to the key result, based on the higher expert ratings of the novelty of the news articles written with INJECT. The expert rating process was subject to different threats:

- Journalists using INJECT tended to write certain types of feature articles, rather than other types of news articles, which might have introduced bias because the experts were not comparing news articles of the same types. However, the analyses reported in the Results section enabled us to reject this threat;
- One consequence of comparing the news articles written by the same journalists over 2 periods of time is that each of the journalists will have gained skills and experience, and might be better placed to write more novel news articles, independent of INJECT's support. Indeed, the data from the focus groups revealed that more experienced journalists tended to write feature news articles, suggesting an association between experience and novelty. Although we sought to keep the 2 periods of data collection to only 12 months apart, we cannot ensure that increasing journalist skills and experience might have been a contributing factor to the result;
- Time might have also introduced a possible threat to the expert ratings themselves. In simple terms, the experts might have been more likely to rate news articles about events and issues in the last 2 months as more novel than events and issues from 12 months ago, especially if the experts were then familiar with these issues. We cannot rule out the effect of time on the expert ratings, which arises because of the two-phase structure of the evaluation method.

5.3 Future Steps

To conclude, the results from the reported summative evaluation revealed next steps for INJECT's development and exploitation after the end of the funded period:

1. The INJECT tool will be repositioned to support the writing of feature stories rather than hard news stories, and as a tool to support more original journalism, without explicit claims for improving journalist productivity;
2. New INJECT features will be specified and developed to enable it to become a simple one-stop shop for all data and information that a journalist needs to develop news stories based on the new angles and content that are first discovered with the INJECT tool;
3. New configurations of the INJECT tool will be developed, so that it can be embedded as tightly as possible in the current work flows and tools of journalists;
4. New training, guidelines and structures will be established to ensure that journalists using the INJECT tool are provided with support guidance and motivation to learn, use and become proficient with not only the tool's features but also creative thinking techniques.

6 References

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7 Appendix I: Norwegian language interview guide

INJECT Noreg summativ evaluering 2018

Intervjuguide for fokusgruppene med journalistar

Fire journalistar i kvar av dei samarbeidande avisene er med. Samtalen er på tre timar, inkludert lunchpause. Me tek opp fire tema:

1. Kreativitet
2. Produktivitet
3. Kvalitet
4. Teknologi

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1. Kreativitet

Kva er kreativitet? Vert du meir kreativ av INJECT?

- Originalt (i vinkling og tema).
- Overraskande (surprise) og noko nytt (novelty)
- Eureka! Gjennombrot i ei sak.

Kva var det positive med å bruka INJECT? Kva kan bli betre her?

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2. Produktivitet

Korleis var din ytelse som journalist i dei vekene du testa INJECT, målt etter reportasjesjangeren til dømes?

- Lagde du fleire saker enn du ville gjort utan INJECT? (Tala frå loggane viser at det gjekk litt trått).

Diskusjon av vanleg arbeidstempo, saker pr. dag eller andre målestokkar.

- Kvar er det beste muligheit for å speeda opp tempoet, utifrå journalistane sin ståstad?
- Kan eit dataverktøy gjera dekan meir produktive?
- Kva med trusselen frå automatisert journalistikk?

Kva var det positive med å bruka INJECT? Kva kan bli betre her?

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3. Kvalitet

Kva verdi har journalistikken dykkar i samfunnet?

- Samfunnsoppdraget, liksom.

Sakleg truverdigheit.

- God og balansert kjeldebruk.
- Godt språk.

Identifikasjon.

- med personar
- med grupper
- med heile lokalsamfunnet

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4. Teknologi

De brukar mange verktøy i skrivearbeidet. InCopy, Google Search, INJECT, arkivsøk, etc. Har de nokon problem med slike verktøy?

- Tekniske problem?
- Jevnlege irritasjonar?
- Kjensle av ikkje å meistra dei?
- Strevsamt å byrja å bruka nye verktøy?

Har de kontroll over dei teknologiane de brukar?

● Er det de som brukar INJECT til å vera kreative eller er det INJECT som leverer kreativiteten?

Forholdet mellom kontorskriving og ut på oppdrag når det gjeld glede/entusiasme.

Bruka dataverktøy i redaksjonen, på laptop eller mobil.

Er nokon teknologiar betre enn andre?

Kva er din favorittteknologi for journalistikk?