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1 ABSTRACT

This deliverable provides an initial attempt to develop a method for scenario analysis. The Contextual Analysis Model is our tool in this exploration and we suggest this as an approach for analyzing and enriching scenarios for the Gloss project. Our attempt though goes further than Gloss and aims to develop an analysis environment that works as an approach for developing scenarios for integrated spaces as a whole. The attempt to provide a larger context of analysis is challenging, and we argue that an attempt of this could lead to a possible re-use of analysis. Since the model we are using for analysis is a tool for understanding context, needs and expectation of the user we suggest the possibility of identifying pieces of scenarios through analysis. Through visual exploration we wish to outline a possible basis of a future scenario development environment that, supports both the disappearing computer objectives and supports a common language for multi disciplinary teams. The overall goal is to develop a possible taxonomy that show the natural relationships of the paradigms in the model and would allow for re-use of analysis of scenarios in the purpose and possibility to pursue different patterns of use to enrich or build scenarios for new situations.

2 PURPOSE OF THIS DOCUMENT

The purpose of this document is to review and refine an initial framework for re-using contextual analysis. The analysis will be based on existing scenarios for Gloss. The establishment of a possible tool for re-use of analysis could offer lots of opportunities and advantages, such as the knowledge of connections, no connections and possible connections between context and use in a scenario, but we are not necessarily suggesting that this would be the only way forward in this problem space and we leave the space open for change and negotiation. This document should be read both as a tool orienting the research and as a first step towards the development of a language common to different disciplines and work groups who is working with scenarios and enriching scenarios for integrated spaces and objects. The biggest concern and challenge featuring in an attempt like this is to keep the analysis results flexible and abstract, yet re-useable to fit into a range of situation in an accommodating way. As an analysis tool we will be using the Contextual Analysis Model (D5) [1] we developed as a part of a framework developing technology and concepts for integrated spaces.

2.1 HISTORY OF THIS DOCUMENT

Version	Date	Editor/Contributions/Partner	Update	Distribution
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0.4	5/8/03	Andy Wilson, Paula Welen, Pr. Paddy Nixon	Feedback and development	consortium for feedback
0.0	00/8/03	Andy Wilson, Paula Welen	Development and finish	Internal for feedback

2.2 ABOUT THIS DOCUMENT

The document is to be seen as an advancement from D5, where we are describing the tool we are using for analysis more closely. In this deliverable we are describing the possibility of re-use of analysis for scenarios using the Contextual Analysis model from the Design Guidelines. The document is a non-technical deliverable, providing a perspective on how the analysis can be used in both a user and technology perspective. We start of with an introduction of how we got to the problem space we have been attacking in this part of our research. We go on looking at what scenarios are, what they are used for and consider different ways of enriching and building new scenarios. Then we continue with the core concern of this deliverable, the analysis. We start by describing why the analysis has been important to

the Gloss project and how others are using different types of analysis in scenario building. We go on revisiting the Contextual Analysis Model from D5 and its use. We then move on with explaining the use of this model in this particular process and, how the analysis may be reused. We argue, that many advantages can be derived from the development of a re-usable of analysis model. In this section we also explore how analysis results can be translated visually for more accessible re-use. We then go on to touch on the area of evaluation, but acknowledge that this is an area that we need to explore more. We end our deliverable with a conclusion that incorporates our findings and our view on where we are going with our research.

3 INTRODUCTION

We are exploring the possibility of a tool that firstly can be used to analyse and enrich existing scenarios, and secondly be used to initiate a framework for re-using the analysis in other situation and scenarios. We put forward the Contextual Analysis Model as a practical tool that guide the way through selected paradigm questions providing different lenses for analysis. This deliverable is reflecting the extended practical use of the Contextual Analysis Model we have presented in D5, Design Guidelines for Integrated Spaces, and a first attempt to model the analysis in a visual way that would help the understanding of the information space of a scenario. We hope to assemble these findings and explore different patterns of information. This pattern formations has a possibility to lead us to further research development of a taxonomy containing the different paradigms families of the model.

This deliverable takes its origins for analysis in the Scenario document produced for Gloss project in February 2001; *Bob goes to Paris*. [2]

As pointed out in some earlier deliverables (D4 [3] and D5 [1]), one aspect of the Gloss project is concerned with building a design platform for the development of technology and concepts for integrated spaces considering both the design process and the disparate team skills. Our goal is two fold; one is to provide tools for framing questions in the development process and the second to support a common focus for a multidisciplinary team. Scenario development has an important role in the design process and provides the whole team with a Meta and Micro picture of the project and its development. What we would like to have is a component kit of building blocks for building scenarios that have already been analyzed and critiqued.

4 GLOSS RESEARCH INITIATIVE

The world is an information center and its inhabitants already have a lot to deal with. If we are going to be successful in our suggestions of a smart global environment and not simply add to the information noise in the city we need to have a good idea of a humans behavior in space and time.

Part of our research is to develop an instrument that can orchestrate a complex environment to cope with the behavior of the user. In the development of the infrastructure of the project, humans will interact with their own logical presence, informing it (explicitly or through user modeling) of certain key information. This information will allow the system to predict, what interactions may be expected with other individual, organizations and physical context, based upon the physical location of all relevant entities.

During this aspect of project our has been driven from the point of the user. At the very start of the project we were a part of developing the initial scenario of the Gloss project. In parallel with this we developed the concept the TRH tools, Trails, Radar and Hearsay which describe the close links of continuity, connectivity and communication from a technical perspective. TRH has been used consistently through the whole project by all the partners and has acted a common vocabulary for reasoning. The role of the user also had a central role within the concept of Interaction Archetypes in D4. In D5 we continued to put the user in the center whilst around it we strapped five paradigms; State, Identity of place, Values, Information and Form of space. These were used to create design guidelines for integrated spaces. In D5 we also combined these three concepts,(TRH, Interaction Archetypes and the

Contextual Analysis Model) in a larger framework. This line of research has proven very useful for us and the other members of the consortium and we attempt in this deliverable to advance it. In our latest exploration we looked back to the original scenarios and wanted to find ways to enrich. We looked at various options, also included in this document and ended up in a very interesting problem space, that of analysis. Moving on in this area we recognized some parallels to some of the research we have been undertaken and have ended up in attempting to build a framework for analysis and, perhaps more importantly, for re-use of analysis.

5 ABOUT SCENARIOS

Using scenarios in the design process is a method of developing and projecting new situations and artifacts in a contextual form. Scenarios are a concrete story about use. Scenarios could be seen as closely related to storytelling. Storytelling is filled with dreams and myths, similar to scenarios. Storytelling is a way of coping with reality; this is also true for scenarios. Scenarios puts use in a macro perspective at the same time as in a micro perspective, this is why scenarios are especially useful in a multidisciplinary team where development can occur at all levels.

Scenarios anchor the design process, at the same time as evoking reflection, and focus that reflection on situations of use, both as they occur in the real world and in the future.

In *Morphology of the folktale*.1958 Propp [4] has suggested that a scenario has six elements of characteristics being:

- Setting
- Agents/Actors
- Goals/objectives
- Action/events
- Change
- Use

With these characteristic elements Propp suggest a way of building a scenario with the above elements as building blocks. This would be a working design representation that is tied directly to the situation of use. Our concern in this deliverable is more in the realm of analyzing and enriching and possibly re-using pieces of existing scenario. We look at the scenarios in a reflecting manner pointing out potential consequences, trade-offs, dependencies and side effects.

5.1 USING SCENARIOS

Starting with scenario-based design approach is just one of several design processes one can take during a project like Gloss. The *Cumulative design* process is one which, as it sounds, accumulate information by observing human impact and behavior in a space over time and allowing this to guide the future design. *Prototyping and rapid prototyping* is an iterative process that is closely linked to mock-ups. *Mock-ups*, which are an empirical (build it and see) design method first published by *Dreyfuss H. 1955. in Designing for people* [5] The *Empirical design process*, which is yet another, studies current practices and needs with videotapes. People are asked to think aloud; this gives a lot of information but puts an analytical burden on the designer. Material like this should be analysed by experts in anthropology or psychology. *Cooperative or participatory design* is yet another approach, where members of the users are asked to join in the design development. The downside of all of these approaches is that they are a very expensive way of working since the state of analysis today is static and cannot be used again in another problem space. Donald Schön suggests another version of a design process in his book, *The reflective practitioner* [6], where he describes an approach called reflection-in-action. This approach is applied to the actual

design activity, in contrast with iterative feedback cycles of preliminary design activity followed by reflective analysis in design review or evaluation.

In practice we have been using more than just a scenario –based approach in developing the Gloss project. We have practiced both cumulative design and prototyping in parallel to the scenario-based approach. During the Gloss project we have used a scenario- based approach both to narrow down the design space of Globally smart Spaces and to keep a very diverse team communicating consistently. This has proved very useful and has been adopted to be a part of the whole design process. In the following section we will reflect on how we initially got to the scenario “Bob goes to Paris”.

5.2 BUILDING SCENARIOS

After identifying the characteristics of a scenario there are a lot of ways to proceed to build it. When UJF and Starlab (former partner) built the scenario for Gloss it was a mixture of two methods - *a theoretical approach and a technical approach*. Later on *ethnographic fieldwork* has been undertaken based on the context of the Gloss scenario. The analysis of this observation is under progress as we write this deliverable and for now we refer to the fieldwork done in the deliverable Raw Observation Data (D6)[7]. By starting off with the two named methods above instead of starting with fieldwork, we gave the ethnographer a narrower bandwidth of observation to concentrate on in a vast information space. “*The fieldwork takes the scenario as a point of departure. The scenario is useful as a ‘first step’ in a number of ways. It is useful because it delimits the focus of the Gloss smart space and user experience. That is, in a project concerning “Global smart spaces” it is useful to have some limit to the territory one might want to investigate*”[7] Field studies often brings to light facts in the background of the context of the use, circumstances and relationships that will be taken into consideration when the anthropological analysis and ontology are finished. To *Reuse Prior Analysis* is also a way to create new scenarios. Other developers have already critiqued this information; the downside of this is that they are usually anchored in particular tasks and tools. One way of supporting scenario reuse is to identify different categories and sub groups; this is called *Scenario typologies* and can, as an example be categories of actors, tasks or contexts. It is in these two last named approaches where we have found our objective for this deliverable, in attempting to find a way where the tasks and tools might be anchored in a more abstract way to give flexibility to be used in many situations. In parallel to the last mentioned approaches we are also practicing an approach called *Transformations*. Edward De Bono [8] who is the developer of this technique describes it as a type of brainstorming techniques that transforms an idea by changing different variables like time, actor, task etc.

5.3 CONCLUSION

Building scenarios is important to the development of new technology. As mentioned above scenarios anchor the design process, at the same time as evoking reflection, and focus that reflection on situations of use, both as they occur in the real world and in the future. In this deliverable we want to point out the analysis. Our key concern is to potentially provide tools for analysis that can be used in multiple situations. If we achieve this we have a good possibility to provide tools for developing experience and continuity for a coherent re-use of an analysis of a scenario or pieces of a scenario. The re-use of analysis would give the developer an extended opportunity of experimentation with different types of scenario building to fit the purpose of the product in an affordable and timesaving way and still be able to find the best combination of content, context, service and media for the user.

6 ANALYSIS

Developers need a language for keeping track of the conversation with the design situation, for recognizing and addressing the numerous trade-offs and dependencies among elements of design problem. They need techniques for comprehensively managing of design changes, consequences for software and for incidental social interactions.

When we first set of to create our scenarios we practiced a combination of a Theory-based approach and a Technology-based approach, where the push came from a theoretic tool concept of THR – Trails Hearsay

and Radar (D4 and D5) and the pull came from the values that follows the Disappearing Computer initiative. TRH were developed as metaphors of what we wanted Gloss to become. – A project about Continuity, Communication and Connectivity. Within our framework of Design Guidelines (D5) we developed a Contextual Analysis model that together with the TRH suggested an initial framework of how to develop integrated spaces. In this section we first look at other ways of analysing a similar task and then we move on to describing how we have applied the analysis in Gloss.

6.1 ANALYSIS BY OTHERS

The Contextual analysis model we use for our analysis works as a filter. Within the different paradigms of the model, Interaction Archetype, State, Identity of place, Value, Information and Form of space, we examine the narrative and the context of the scenario before we continue to explore and enrich them.

Schön's design analysis [6] from 1983 (the reflective practitioner), Schön emphasizes that reflection and action must be closely practiced to have the best result. Schön contrasted such an interactive process with traditional hypothesis testing in which abstractions are decomposed, instantiated, evaluated, and then either rejected or maintained. *Usability rationale*, another type of analysis is an extension from pure scenario-based design where the potential causal relationships between features of a design and consequences of use are made explicit.

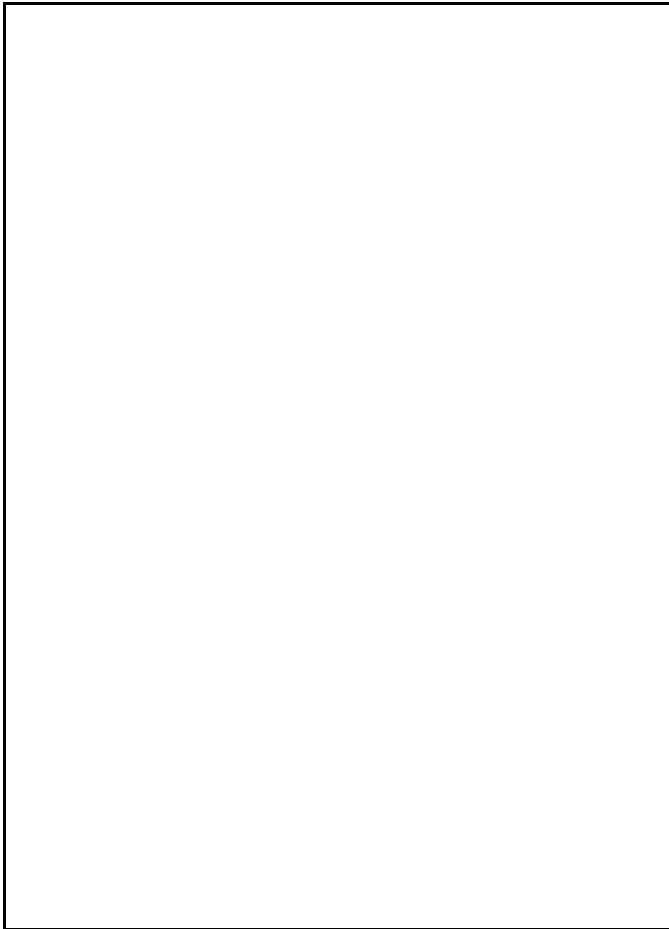
Scenarios are narratives about people and what they might do; usability rationale, such as *Claims analysis*, goes beyond this to offer explanations of the scenarios, an analysis of why the scenarios occur. Claims analysis provides a more explicit and detailed requirements than the scenario. Where a scenario firstly is an invented story of what people might do or not do, the claims analysis goes beyond this and describes how and what can happen if a certain situation arises. *Requirement analysis* is a link from the claims analysis where one looks at the up and down sides of the requirements. These three methods are closely linked and their usage is dependent on what depth of analysis one requires.

Another very much used analysis is *Design memoir*, where the designer reports and captures her intentions with the project. Then as the project unfolds one can go back and see what was done and what was changed. A design memoir is very subjective and reflects only on the intentions of the design. An objective analysis can be hard to identify from this type of analysis whilst the scenarios and usability rationale base their result on empirical hypotheses, which can be observed and experimented with.

Trade-offs and dependencies is another way of analysing a scenario. Here the main focus is to find possibilities and opportunities and to look at the scenario from different perspectives and to establish relationships and dependencies inside the scenario. This way one can find new ways and variations of a similar scenario module.

From a practical perspective of how to perform an analysis we have focused on Claims analysis. John Carroll suggests in his book *Making Use* [9] seven ways of making a claims analysis; *Cause and effect*, where one literally summarize what is in the scenarios. *Participatory design*, where users look at the intentions and scenarios of use. *Systematic questioning*, where one questions all events, action etc. *Questioning stages of actions*, where the user set up goals and then analyse the consequences of the action, re-evaluate and so on. *Being copied into new situations and domains, reworked and fitted in to new possibilities, analogically extends Reuse of prior analysis, scenarios and claims.* Theory-based Claims are often held on an abstract level with specific boundaries of kinds of situations where they can be applied. Then there is claims analysis through *Transformations*, as a claims analysis is always an ongoing process this method pushes the boundaries and tries to view the scenarios through the lens of further data. One technique is to refractor the claims linguistically; another one is that of denying a casual consequence. Other questions for transformation are to ask what can go wrong in this scenario or to simply recast the scenario from different point of view. This last method, transformation, is something we use a lot of in our approach to analysis.

6.2 GLOSS AND THE CONTEXTUAL ANALYSIS MODEL



The contextual analysis model we suggest has as a central core of the users perspective with relation to the environment around them and other users (models). We use it in an analytical manner to come to questions and conclusions. It is a tool to help clarify the complex system of an urban landscape, in this case the information landscape of the scenario. We like to describe the model through the words of Bill Hillier. He describes a process similar to our model as an idea-to-think-with-[10] “Analytic knowledge, or scientific knowledge is knowledge where we learn the abstract principles through which spatio-temporal phenomena are related – we might say the ‘configurationally’ – consciously. We are aware of the principles both when we acquire and when we use the knowledge. As a result, through the intermediary of the abstract, we grasp the concrete.” This describes an “idea-to-think-with”, This is how we use our model. We also suggest that there is not a right or a wrong way to use this tool, but only an open ended never static way of using the model. To work with at a constant changing landscape as the urban environment one cannot look at it in a static way, one needs to analyse, evaluate, develop and then do the same over and over again.

The contextual analysis model is a guideline to answer what expectations the Interaction Archetype (D4) have on the state, identity of place, values, information and form of space which are the paradigms of the model and how do these elements effect each other?

The model is a part of the whole process of developing integrated space and has a central role for analyzing the different parts of the project. Here we will explore the use for analyzing scenarios. We will be using the six paradigms; to explore the notions of state, identity of place, values, information, form of space and interaction archetype and the causal relationships they have in the scenarios and amongst each other. The six paradigms have proven useful in our research, but we do not claim that these can not be added to or subtracted from. The tensile forces of the model converging upon the individual and challenge their expectations. As we make changes to one of the elements we exert forces upon the others. To make a change upon an Interaction Archetype’s expectation we can make use of information, which will change the expectations of the individual and apply a force to the Identity of Place. The system represents a competitive dynamic, which is constantly trying to be in balance. We proceed to explore and

investigate the dynamic relationship between the paradigms in the model. As this virtual context model imitates the real world we can get a clearer visual picture of how to change a situation (example; a scenario) by the individual impacts of the paradigms. This is why the model is an excellent tool for investigating scenario

6.3 THE PARADIGMS

The model's purpose is to change or reinforce the paradigms of the system. You start by defining one of the paradigms that you wish to change or reinforce and you try to optimize the chosen by exploring the forces of the other elements. We will now revisit the six paradigms.

6.3.1 INTERACTION ARCHETYPES

In deliverable 4, Interaction Archetype (I.A), we developed a concept for clustering user's state. Clustered into archetypes of behavior in the context of architecture, other people and social context. For example, dweller, tourist or commuter. We suggested a methodology for defining what interactions are desirable between individual, activity, space and time. In terms of technology, the interaction archetypes are a way of setting down and reflecting upon our assumptions about different elements of system and interaction.

The I.A has been developed with the Contextual model. The development has been combined with reflections on the literature (including ethnographic literature), and discussions of some initial observations. I.A is defined as follows:

- Mode (educational, shopping, social, work, etc)
- Time (night time, day time, lunch, weekend, etc)
- User
- Expectation

In a multidisciplinary team, people would view the interaction archetype paradigm from the domain of design and anthropology.

6.3.2 STATE

At first, the state is a seemingly simple area. The physical aspect of state is, after all readily observable. The physical is supportable through ergonomic means. But, we have not stopped at the physical, as we have divided this section into both physical and mental. It is the inclusion of mental state that adds the complexity to the equation. The user may be performing a physical task but the internalized mental state, which occurs in parallel to this, may alter the definition drastically. The area of the cognitive is still relatively unexplored even by those whose area of expertise lies in this domain. The cognitive remains relatively unobservable, yet it's existence cannot be ignored as it has large implications in the system.

- Mental (sensory perception, Mental imagery, Inner speech, Conceptual thought) Memory,
- Emotional Feeling, Volition, Self-awareness, Dreaming, Lucid Dreaming)
- Physical (Playing, Creating, Sex, Sleeping, Walking, etc.)

In a multidisciplinary team, people would pursue the state paradigm from the domain of HCI and anthropology, both being observant of human behavior.

6.3.3 IDENTITY OF PLACE

'Liminal spaces': they are boarder crossings, places where the different worlds of the inhabitants of the urban field touch each other [11] If you add embedded technology into these liminal spaces you will have the attributes of a smart space. Inhabitants share the same place but might use it differently. Example is a park where kids are playing games, families are having picnics, and people work and study

and others are on a date. The different activities will give different identities to the space - play ground, workspace etc

- Meta (metropolis, city, town, village, building)
- Macro (factory, theatre, library, house and elements of infrastructure)
- Micro (town square, street, restaurant, table, toilet etc)

In a multidisciplinary team, people would pursue the identity of place paradigm from the domain of architecture, anthropology and sociology.

6.3.4 VALUES

When exploring values we quickly realize its importance. The value system can be a range of limits that delineate the acceptable behavior for the other components of the model. The users value system changes constantly. Moving in and out of different roles/interaction archetypes, the worker, the mum, the dad, the son, the lover, the tourist etc., our envelope of values is contextually altered, too. From an architectural perspective, the built environment can attempt to embody and support these value systems.

- Social (family, friends, community, species etc)
- Culture
- Spatial

In a multidisciplinary team, people would pursue the value paradigm from the domain of design and anthropology.

6.3.5 INFORMATION

Information is the most flexible system we work with when to designing smart spaces. Information is basically everything we experience around us and come in all the forms that our body has senses to cope with.

Text is one of the more common perceptions of information and it is applied all around us. Users expect text to be part of the urban landscape. Pictures, moving images and films are information and used effectively visualization can provide insight and allow valuable data to be collected and used for quick decision-making. Our goal is spaces that supports the information the user need at the time whether it is a public or a private message.

- Audible (oral, instrumental)
- Visual (one, two, three, four-dimensional)
- Smell (Olfactory)
- Taste (sweet, bitter, sour and salty)
- Touch (pain, thermal detection, texture)

In a multidisciplinary team, people would pursue the information paradigm from the domain of HCI anthropology and design.

6.3.6 FORM OF SPACE

Form of space is the physical elements of the city or buildings such as, street, square ,stairs, hall, rooms, people and objects. Also the geographical location has to be taken in as an element, east, west, hilly, flat, etc. As described in Space Form Analysis 2.4 in D4 Interaction Archetype: The basic architectural elements can be divided between form and space. The building blocks of three dimensional form can defined as point, line, plane and volume whilst spaces and places as suggested of Lynch [12] are put together with nodes, paths, edges, district and landmarks.

- Shape (configuration of surfaces and edges)

- Size (length width and depth dimensions)
- Texture (characteristic of surface effecting light-reflecting and tactile qualities)
- Position (relative to environment or visual field)
- Orientation (relative to ground plane, compass points, and individuals position)
- Visual Inertia (degree of concentration and stability dependant on the geometry, orientation relative to ground plane and line of sight)
- Other users (Our spatial relation and density of other users)

In a multidisciplinary team, people would pursue the information paradigm from the domain of design and architecture.

The structure of the model and its paradigms is developed to support the mobile, often immaterial, shaping forces of the contemporary city. This involves an assumption that the classical models of pure, static, essentialised, timeless form and structure are no longer adequate to describe the contemporary city and the activities its supports. We believe that a contextual analysis model that supports the dealing with changing information gives us a new medium in which we can conceptualize old problems in new ways

6.4 ANALYSING WITH THE CONTEXTUAL ANALYSIS MODEL

In this section we will unfold our idea of using the Contextual Analysis model for analyzing scenarios. We hope to get an endless combination of context in the analysis that can be tailored for re-use and applied in a diverse range of narratives. The goal is to reach a point of balance between the individual's expectations and the delivery of information. To do this we need to explore and find the spot of balance between keeping the result particular, yet abstract enough to be applied in different situations. We will start exploring the components of the analysis, and then we will make an outline for an attempt to explore the analysis in a visual manner.

6.4.1 COMPONENTS OF ANALYSIS

1. Timeframe consisting of a defined period and instances.
2. Contextual Analysis Lenses – Information, State. Form of Space, Identity of Place, Values, and Interaction Archetype.

Firstly, we must identify the timeframe of the scenario. Has the scenario taken place over an hour, a part of a day, a whole day, a week, or is it the time between two haircuts. From this point we must identify a usable instance to allow us to break up the period. This may vary widely, depending on the focus of the analysis, this is not prescriptive, and picoseconds may be of use for some scenarios compared with hours for others.

After defining a period for the scenario and breaking this into instances, we can produce the layers to contain the information gleaned from the scenario through the Contextual Analysis Lenses – Information, Form of space, Identity of place, Values, Interaction Archetype and States. These layers contain the information of identifiable instances in the scenario where the paradigm is active within a narrative. We have illustrated this in the following diagram where we have defined certain instances of times of interest and marked out what paradigms are active within this timeframe.

In the following diagram we have been looking at the six first sections of the scenario “Bob goes to Paris”. In this diagram we have not identified time and we are looking at it from a users perspective and we are leaving the analysis of the technology to further investigations.

6.4.1.1 SCENARIO

Bob lives in Brussels. He drives to the train station to take the train to Paris for a business lunch with his colleague Jane. While Bob is in Paris, he hopes to see a bit of the city since he has never been there before. In the afternoon, Bob will take the train back to Brussels. Here follows the six sets we have analysed, where the first two are short instances and the last four are identified to happen over a very short instance:

1. Bob gets directions to a free parking space outside the train station. The parking space is activated by his arrival and connects to Bob's PDA to request his parking requirements and profile. The PDA specifies parking for 10 hours with travel to Paris (the PDA has this information because the PDA acts as Bob's train ticket.) The profile allows the parking space to debit Bob's bank account for the payment of the parking and to obtain other information. Bob's PDA refuses to provide some of the requested information in order to protect his personal privacy: the parking space does not need to know that he is travelling first class.
2. Once Bob has parked, he is informed that the train is on time, and will leave from platform B, and that he should use the red entrance and that he should follow the red pathway to get to his platform. Because Bob is not listening to the radio, the PDA decides to communicate this information by vocal command using the car speakers. Other possible communication channels include a personal headset (sown into his jacket) and a heads-up display on his car window. The heads-up display tends to make Bob ill, so he has instructed the PDA not to use it.
3. The red route is not busy this morning. As Bob is walking close to an active wall, he is presented a message relevant to his trip in Paris (e.g. weather forecast, strikes in the public transportation along with alternate trip recommendations).
4. On the way, his PDA vibrates to tell him that he has received a message from his mother's automated house manager. The message tells him that his mother has left the stove on, that she forgot to put the alarm on when she went out and that she forgot to take her PDA and her cell phone. The house has no way to contact her. For security reasons, the house informs Bob that it has been able to turn the oven off, but needs Bob's advice about the alarm system. Bob has privileged access to his mother's house and so, he is able to turn the alarm on.
5. Bob leaves a message for his mother saying that she should contact him when she comes back home.
6. Further along the red route, Bob can see a large display actively communicating that the trains to London are cancelled due to the weather in the U.K. Bob is not directly concerned by this message, but it does explain why there are so few people on the red route.

Sets	Information	Form of space	Identity of space	Values	Interaction archetype	State
1	0		0		0	0
2	0	0		0	0	0
3	0	0	0		0	0
4	0		0	0	0	0
5				0	0	0

6					0	0
---	--	--	--	--	---	---

Through the use of the individual lenses, we identify individual nodes of the paradigm and with this, potential gaps in the scenario. The compilation provides us with a linear, quantitative overview of the body of the text that can be translated into patterns of context and use. What this means and how this information can be used have been touched on in the evaluation section that follows further ahead in the deliverable.

We have further explored this principle through the use of a scenario spanning multiple periods. This could be defined as days of a week, for instance. To understand this we have used 3 dimensional modelling of the experiment with that axes y, x and z as time, paradigm and numbers of days. The following visualization shows a step-by-step explanation of a scenario spanning over multiple periods.

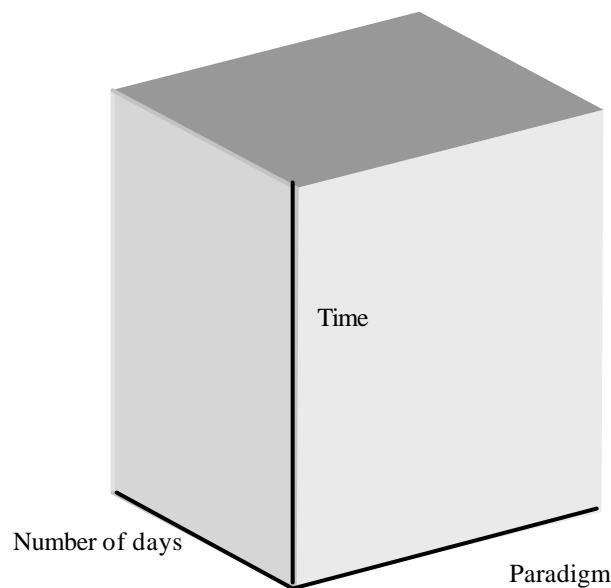


Diagram 2.

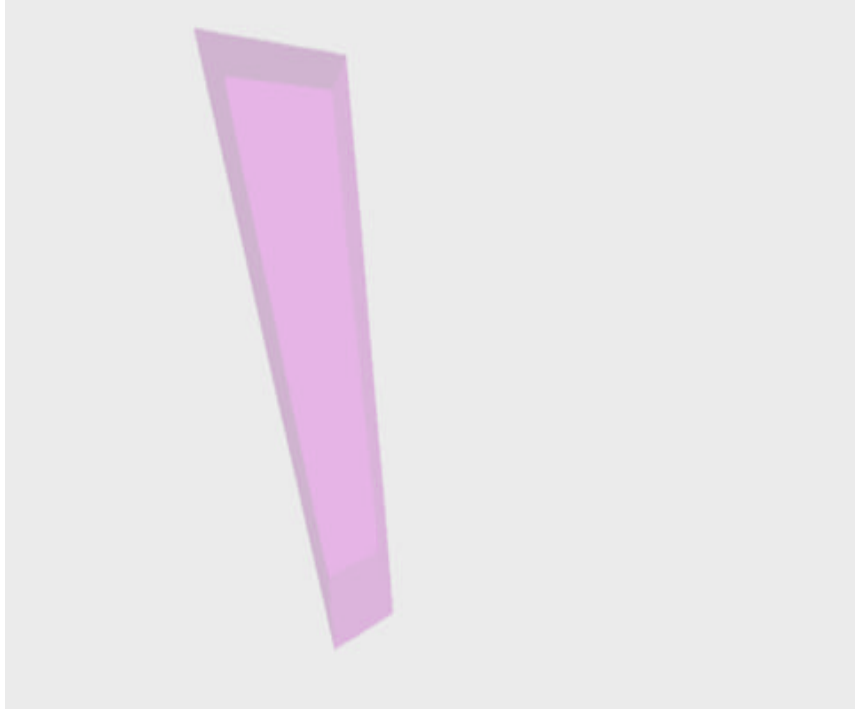


Diagram.3. Single paradigm for the period of a scenario

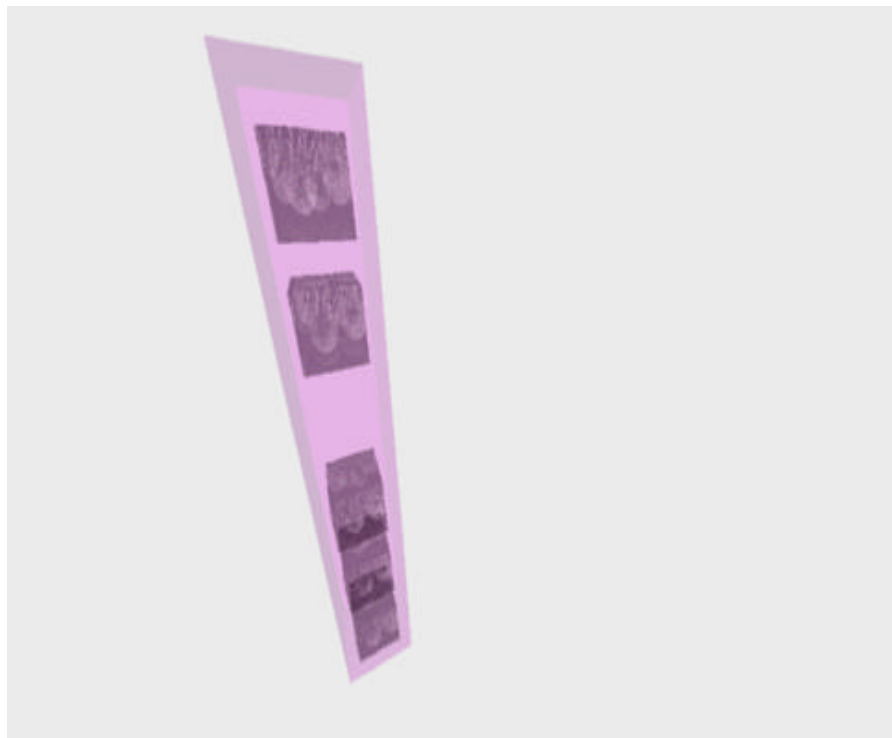


Diagram.4. Single paradigm for the time period with active intervals



Diagram.5. Active node with extended space included other paradigms.

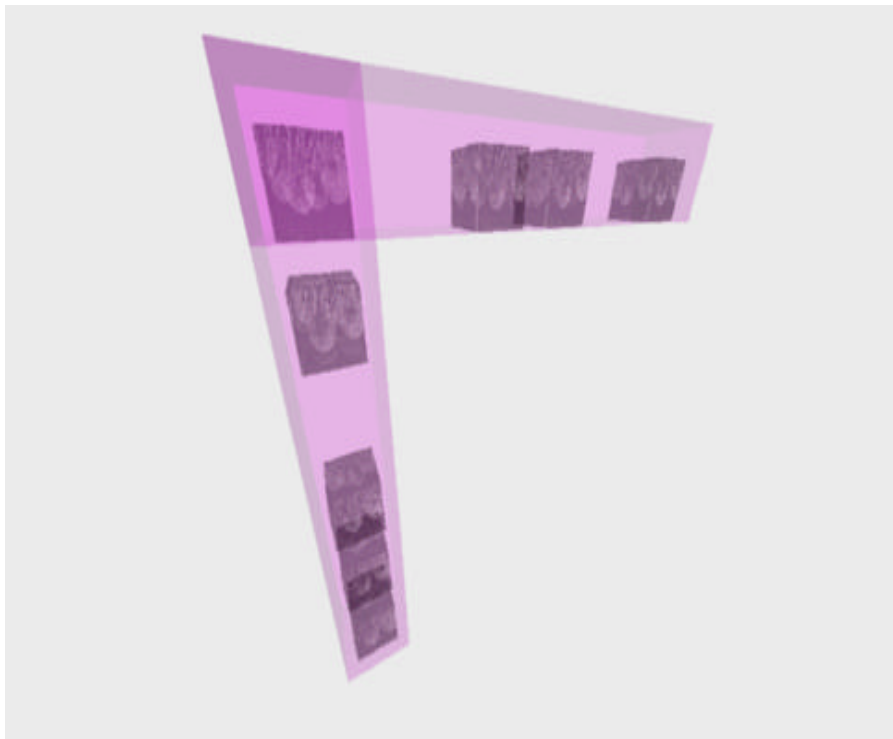


Diagram.6. Active paradigms indicated within the extension of interval.

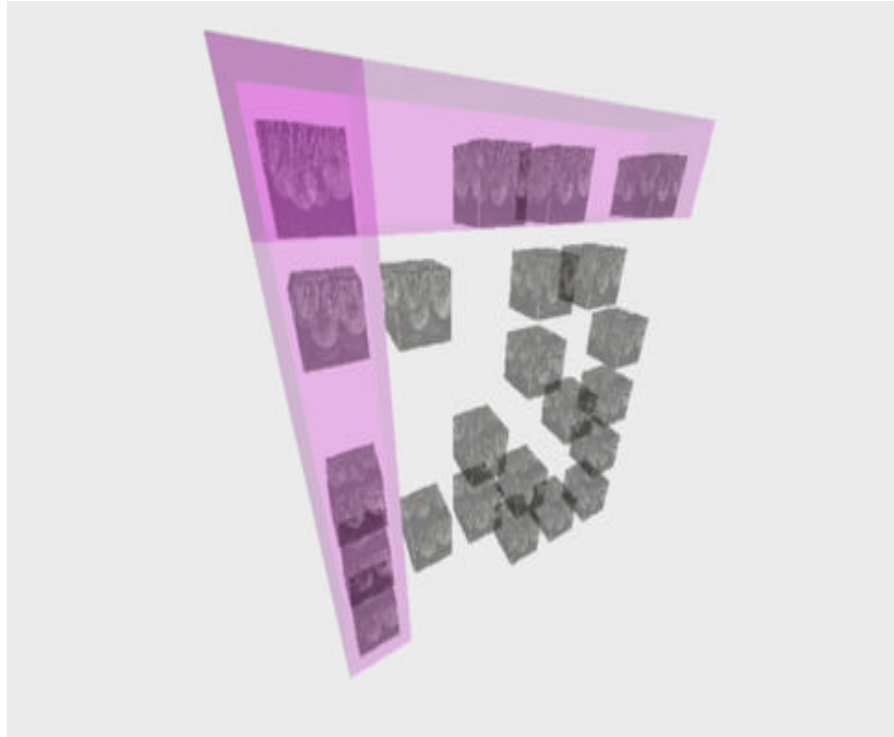


Diagram 7. All active paradigms indicated for duration of one day

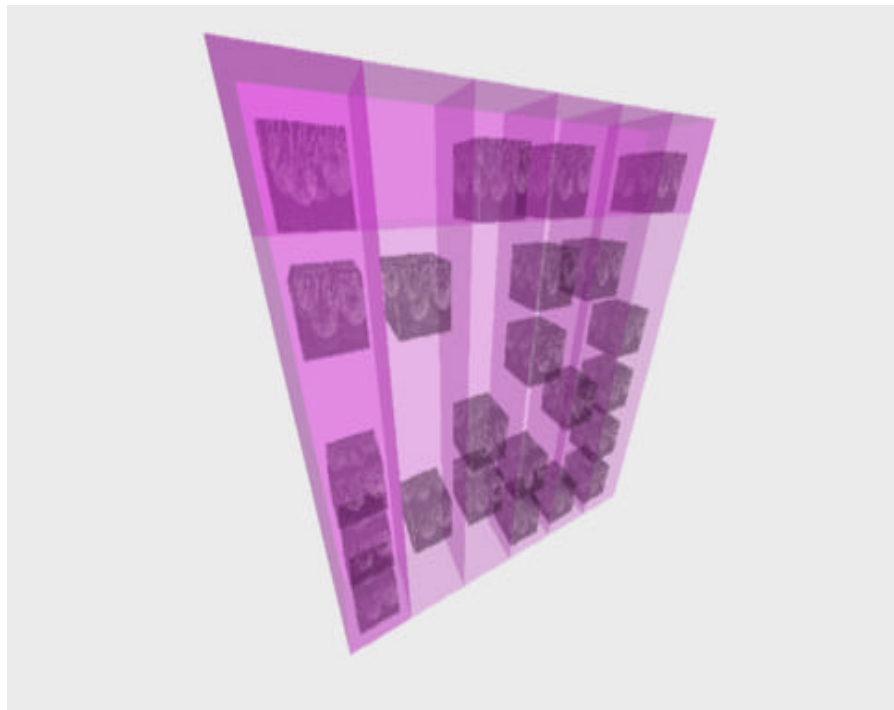


Diagram 8. Paradigms emphasized.



Diagram 9. Information paradigm extended over a week.



Diagram 10. Information paradigm for one week with active nodes

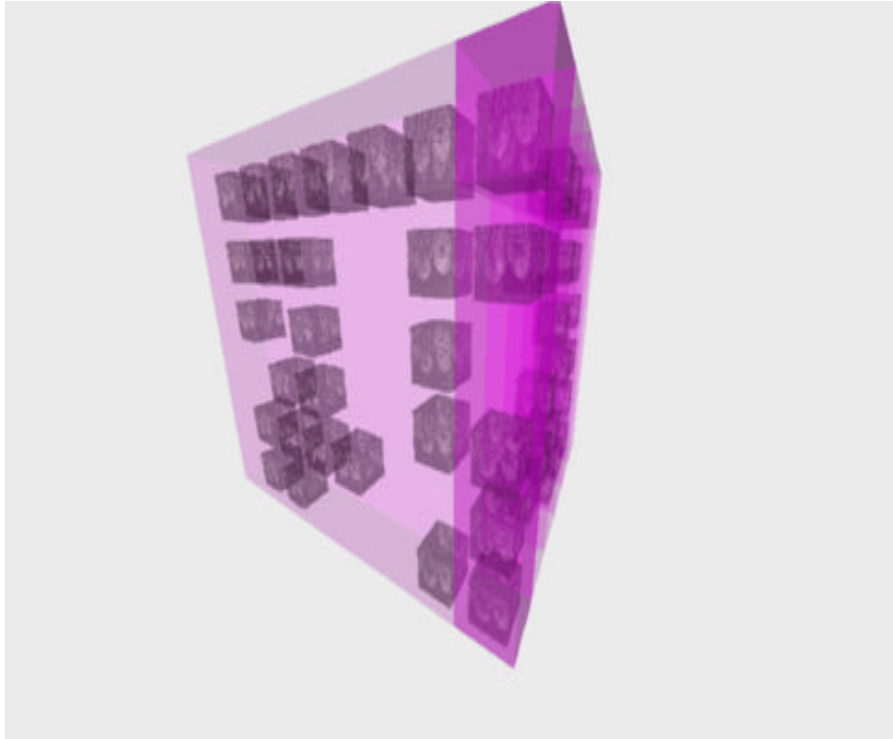


Diagram 11, 12, 13. Alternative views of above.

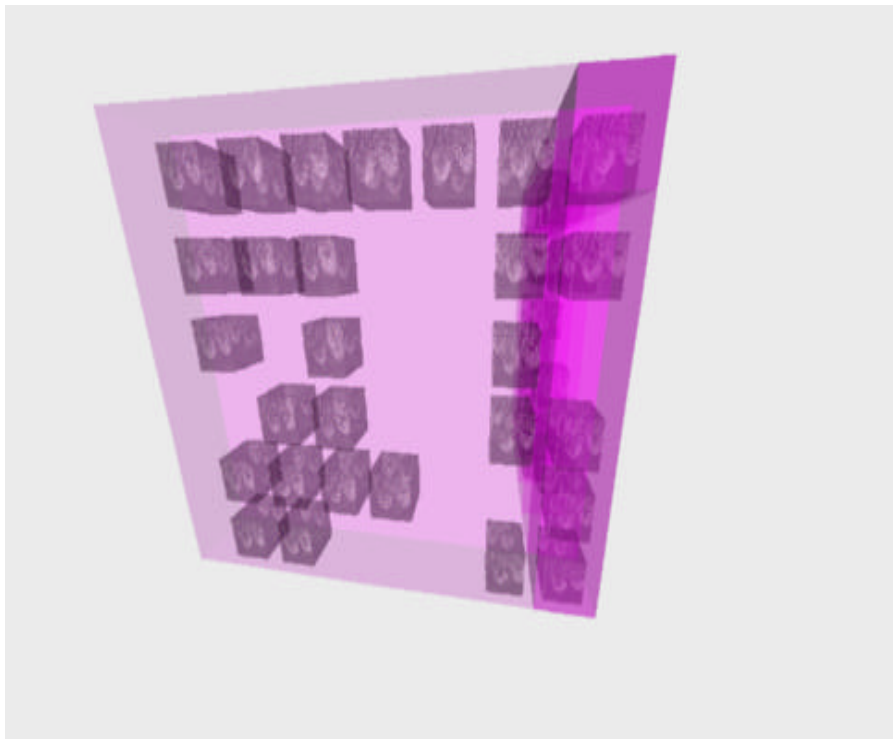


Diagram 12.

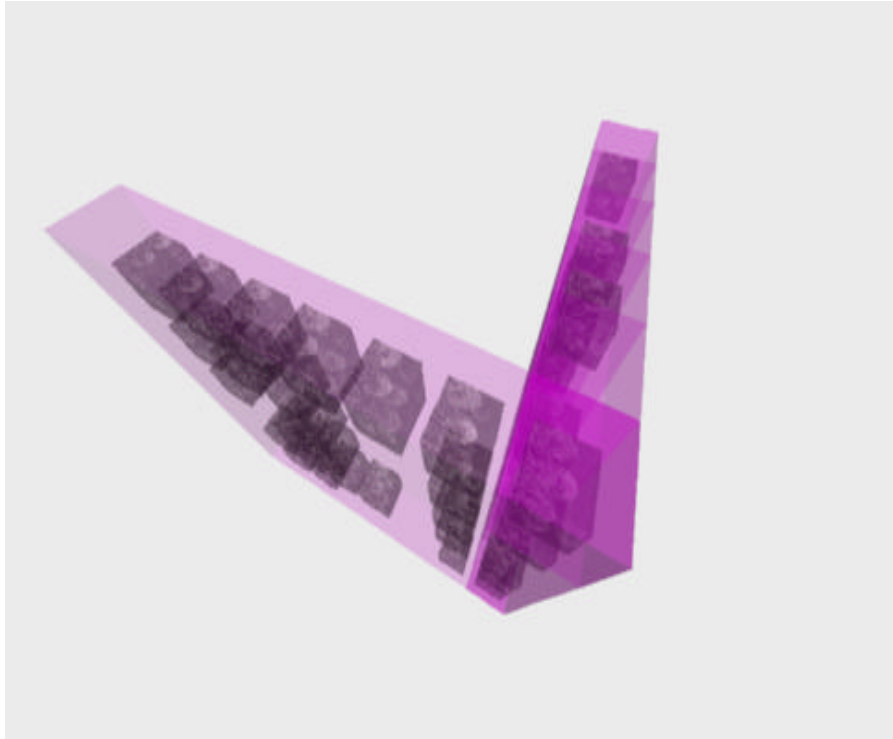


Diagram13.

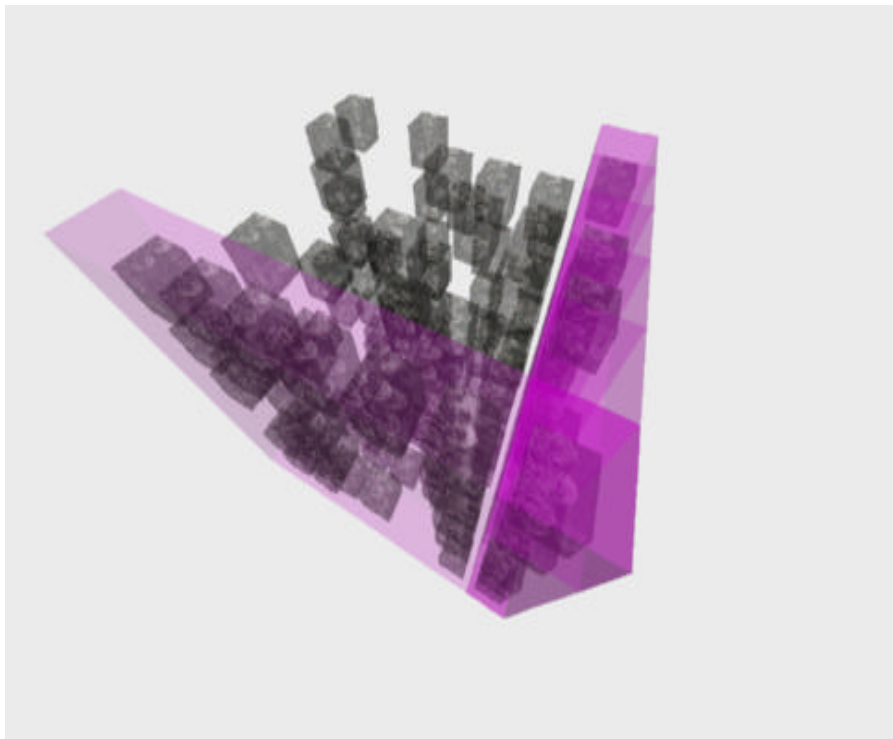


Diagram 14.All active nodes added.

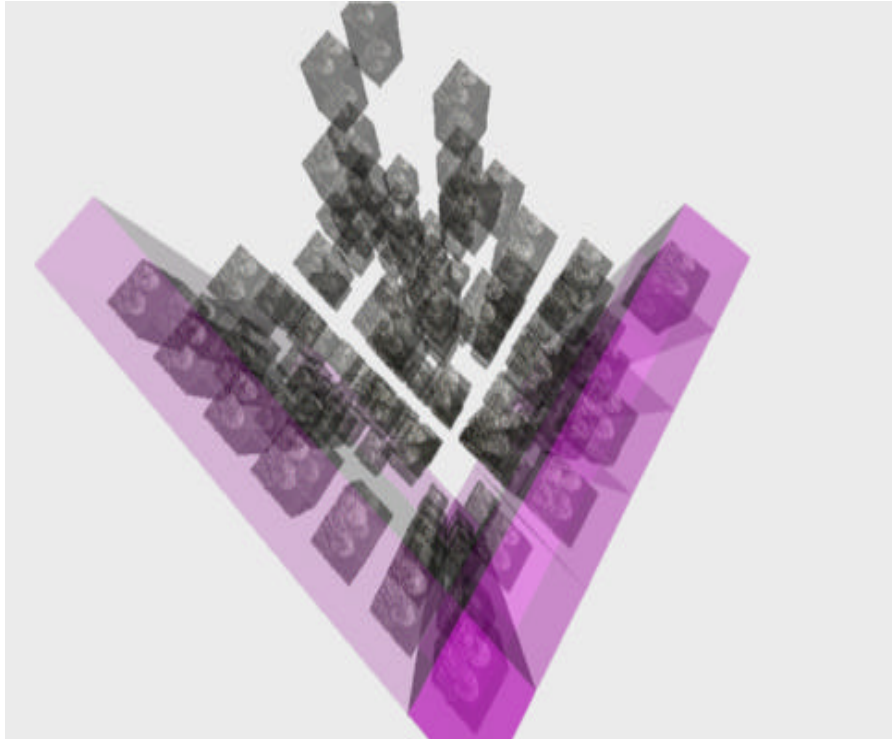


Diagram 15, 16, 17, 18, 19 and 20. All active nodes added, alternative views.

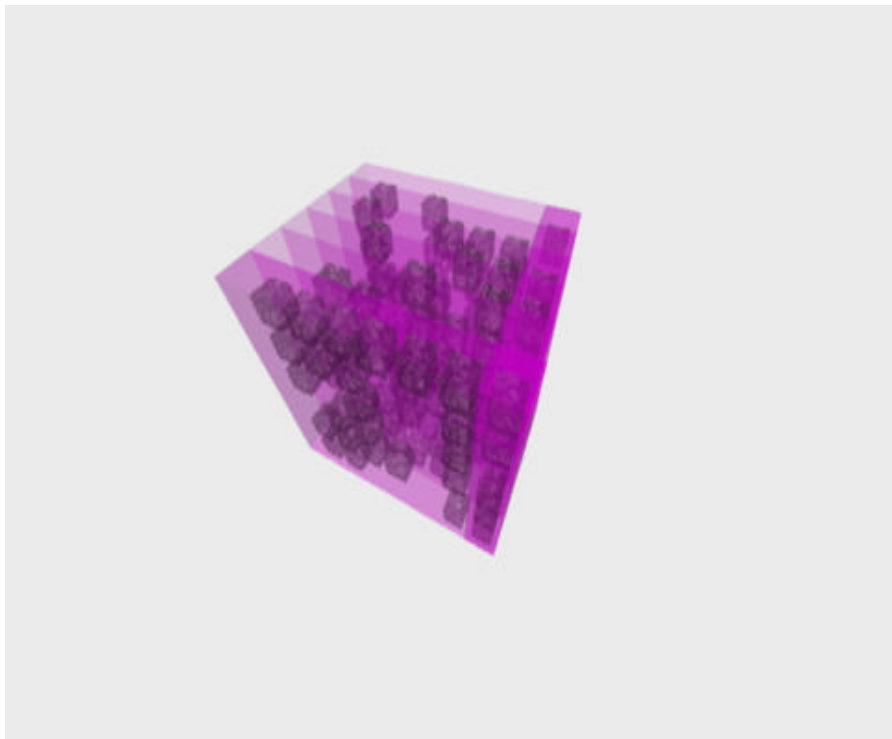


Diagram 16

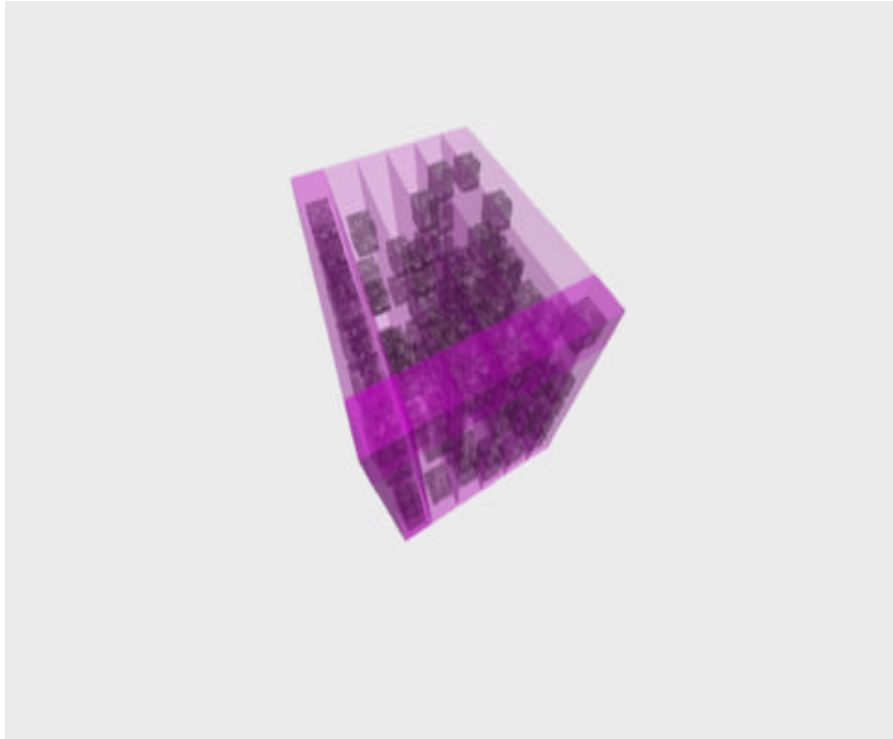


Diagram 17.



Diagram 18.

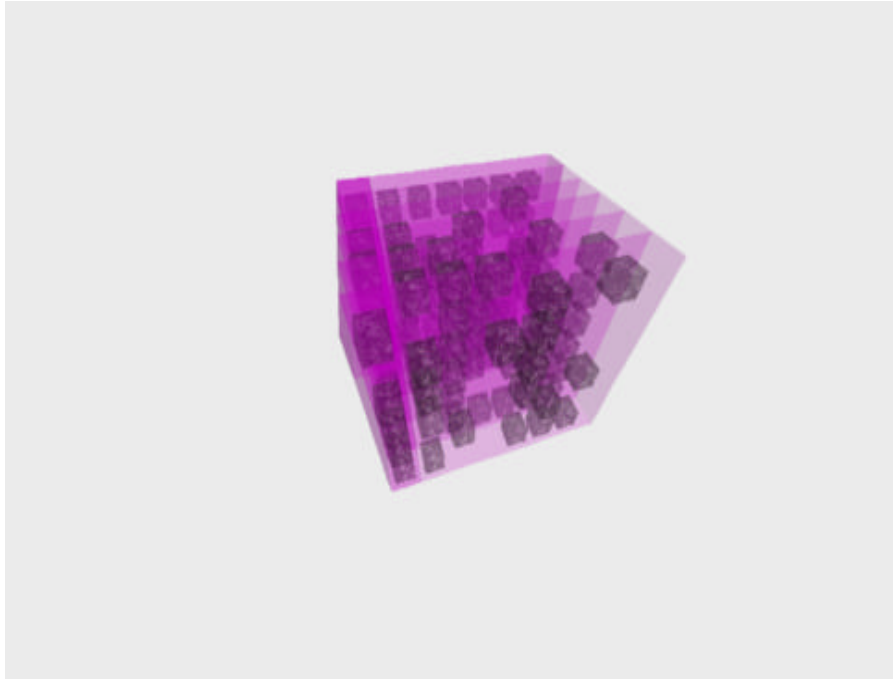


Diagram 19.



Diagram 20.

These visual explorations clearly illustrate the complexity of the problem of analysis of a scenario. It is a complex problem space and to identify any patterns in the space we need to extend the exploration with further modeling. The goal is to find patterns in the information space that can give indications and clues to why and how people are behaving and acting. We have extended the exploration above over a longer period of time and it is evident that patterns arise as shown in these two models below:

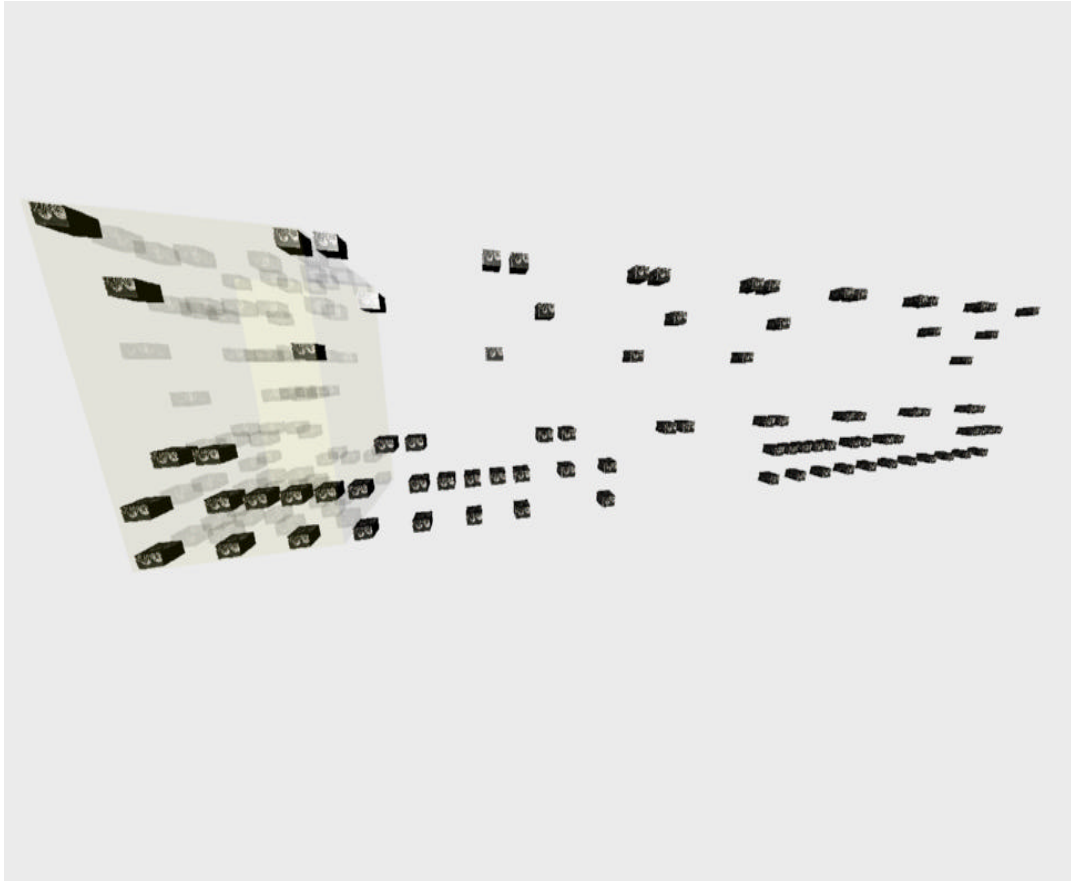


Diagram 21. Scenario with active nodes of paradigms extended over time.

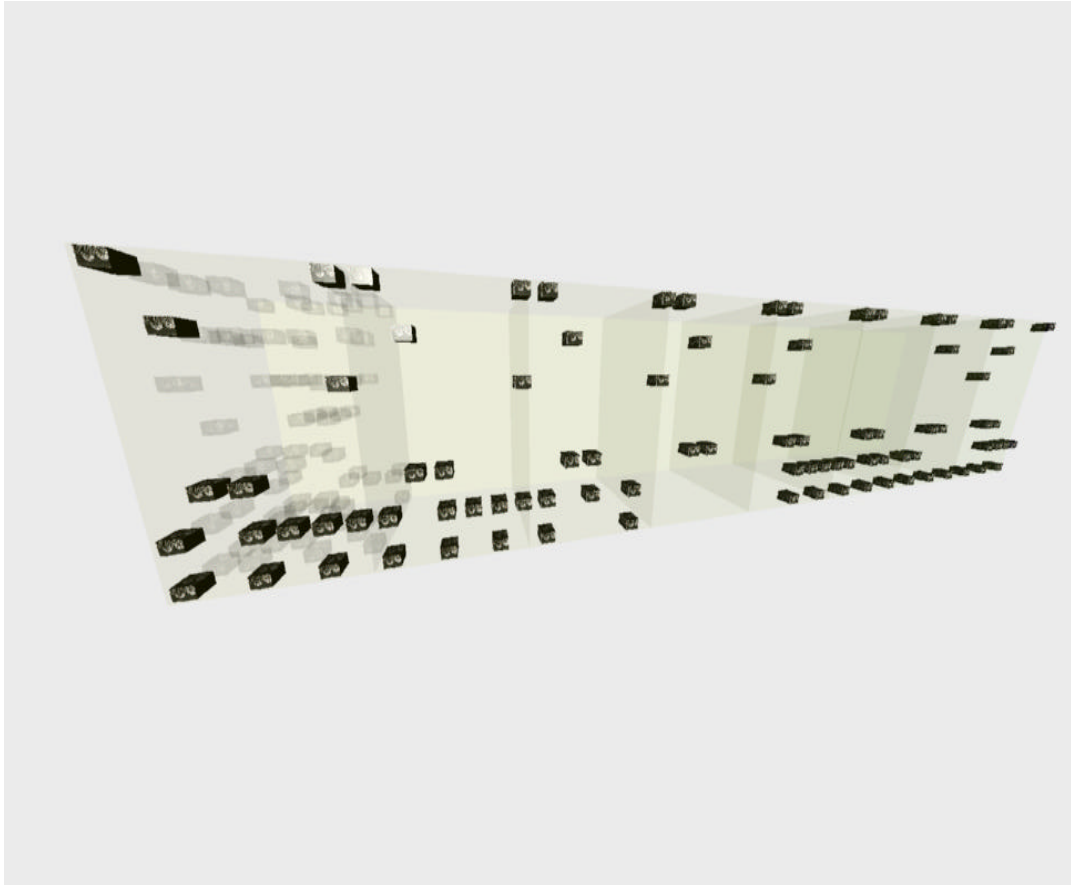


Diagram 22. Scenario with active nodes over time with defined timeframes.

The following four diagrams are showing us a specific example over time. The first two diagrams visualize the state of a commuter over a period of a week, followed with two diagrams where the time is extended to four weeks .

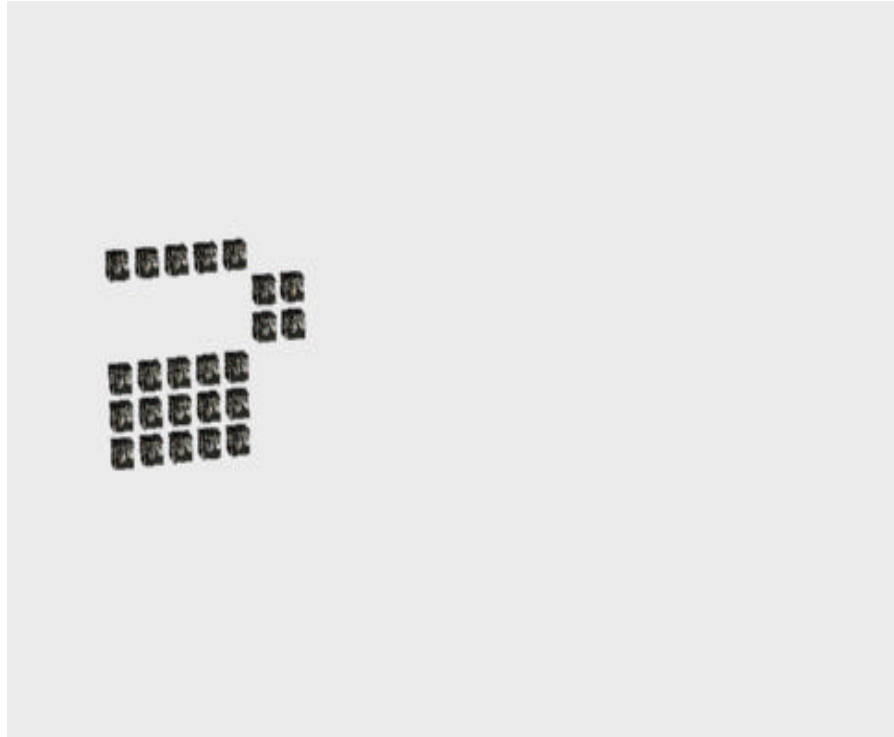


Diagram 23. State of a commuter over a period of a week.

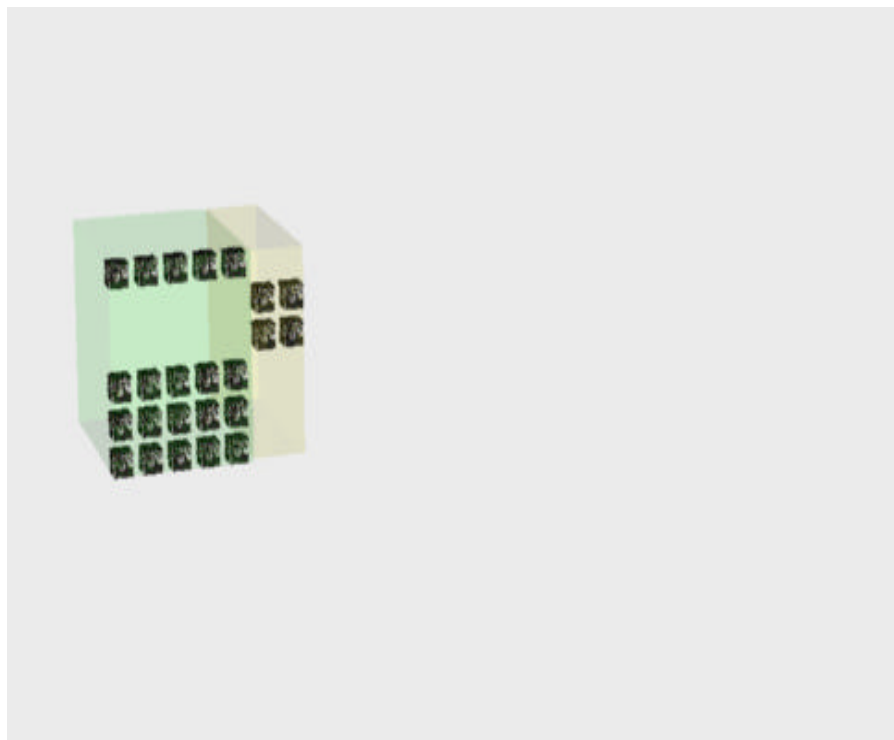


Diagram 24. State of a commuter over a period of a week.

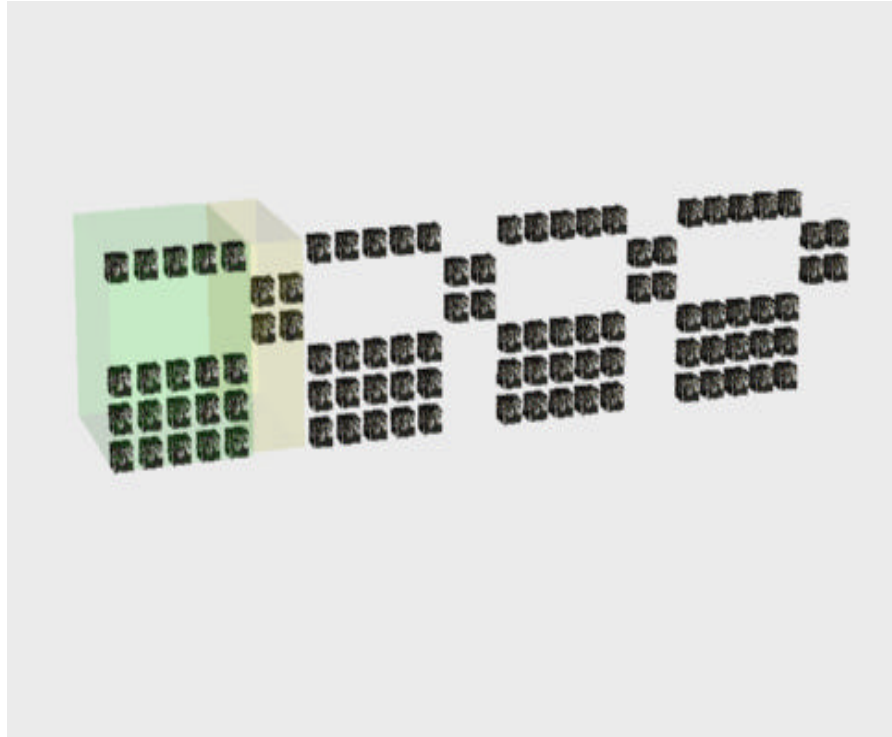


Diagram 25. State of a commuter extended over four weeks.

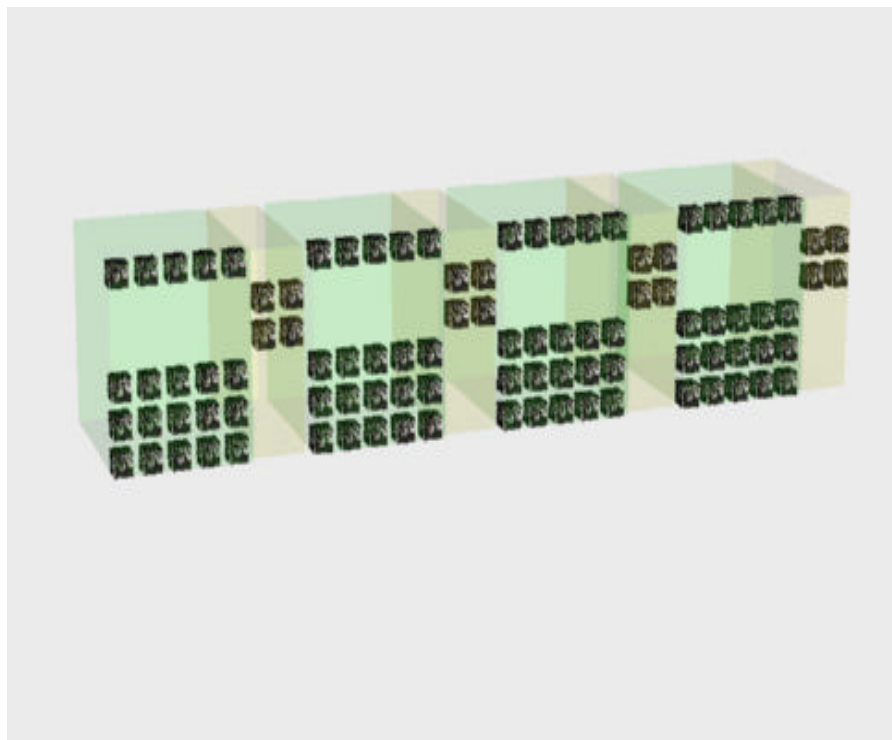


Diagram 26. State of a commuter extended over four weeks.

7 EVALUATION

Evaluation is something that is needed to move a project on. Implicit evaluation is something that occurs with all choices made in a design development. A more explicit way to perform an evaluation is to have some type of matrix one can follow. We have been looking at what type of evaluations that could be used for our analysis and found a few. We have been looking at Scriven's [13] work, where he defines two approaches, intrinsic and pay-off evaluation and two terms for two basic roles that evaluation work can play in the development process; formative and summative roles. Pay-off evaluation produces "solid" empirical facts. Conversely, intrinsic evaluation produces many interpretations but no solid facts. It enumerates features and rationale, articulate positions on apparent trade-offs among features, and assigns value judgment. Scriven propose a compromise of the two approaches. He suggests focusing on explicit goal formulation in the early stages of the design, intrinsic evaluation and modification of goals throughout the design process, and the embodiment of the goal analysis in pay-off evaluation materials. Formative evaluation seeks to identify aspects of a design that can be improved, priorities for redesign and refinement, and concrete guidance as how that redesign a refinement should be executed. Summative evaluation work seek to gauge a design product, to position it on various measurements scales with respect to other design products - for example, measuring performance time and error for standard tasks.

We have also been looking at usability evaluation, inspection methods and trade-off between nodes. It seems like a combination of some of them is the best result at least for what we are trying to evaluate. Implicit evaluation follows through the whole project and it is necessary for moving on. We have made a first attempt to evaluate our findings in the analysis of the "Bob goes to Paris" scenario. What follow is identifications of gaps and opportunities of enrichment of the scenario from a users perspective:

Sets	Information	Form of space	Identity of space	Values	Interaction archetype	State
1	0		0		0	0
2	0	0		0	0	0
3	0	0	0		0	0
4	0		0	0	0	0
5				0	0	0
6					0	0

1. *Bob gets directions to a free parking space outside the train station. The parking space is activated by his arrival and connects to Bob's PDA to request his parking requirements and profile. The PDA specifies parking for 10 hours with travel to Paris (the PDA has this information because the PDA acts as Bob's train ticket.) The profile allows the parking space to debit Bob's bank account for the payment of the parking and to obtain other information. Bob's PDA refuses to provide some of the requested information in order to protect his personal privacy: the parking space does not need to know that he is travelling first class. **Gaps and possibilities:** How does he get information to get to the free parking space? Where is he? How does the form of space look like? Is the identity changing from street to parking? Where is the identification of that change? What values are prioritised? Is he in a hurry or does he have loads of time and what does this mean on the way the information is delivered? We assume that his Interaction Archetype is traveller, how can this be made explicit? We assume he is driving, does his state change during the time he is parking? We are not considering technology at this moment but another set of questions is how aware Bob is about the technology and what is his interactions with it?*

2. *Once Bob has parked, he is informed that the train is on time, and will leave from platform B, and that he should use the red entrance and that he should follow the red pathway to get to his platform. Because Bob is not listening to the radio, the PDA decides to communicate this information by vocal command using the car speakers. Other possible communication channels include a personal headset (sown into his jacket) and a heads-up display on his car window. The heads-up display tends to make Bob ill, so he has instructed the PDA not to use it. **Gaps and possibilities:** In what form of space does he get his information? Does he use the car as an office or is it his private space? Is the identity of space changing or static? What does Bob do to make it explicit to the technology his value set that the head-sets tend to make him ill?*
3. *The red route is not busy this morning. As Bob is walking close to an active wall, he is presented a message relevant to his trip in Paris (e.g. weather forecast, strikes in the public transportation along with alternate trip recommendations). **Gaps and possibilities:** How is the message brought to his attention and does he have to interact with the wall to get his message. How does it get delivered in the least intrusive way? How does the technology know where he is travelling? What values are prioritised?*
4. *On the way, his PDA vibrates to tell him that he has received a message from his mother's automated house manager. The message tells him that his mother has left the stove on, that she forgot to put the alarm on when she went out and that she forgot to take her PDA and her cell phone. The house has no way to contact her. For security reasons, the house informs Bob that it has been able to turn the oven off, but needs Bob's advice about the alarm system. Bob has privileged access to his mother's house and so, he is able to turn the alarm on. **Gaps and possibilities:** How does the change in archetype from the assumed traveller to the concerned son identify itself? Does he change his state when he receives the message? Does he take out his PDA or does he go to the closest interactive screen and interacts with it to deal with the information? Does the form of space support a state more than another?*
5. *Bob leaves a message for his mother saying that she should contact him when she comes back home. **Gaps and possibilities:** How is the information delivered? Is there a specific way that would be more ideal for her to contact him?*
6. *Further along the red route, Bob can see a large display actively communicating that the trains to London are cancelled due to the weather in the U.K. Bob is not directly concerned by this message, but it does explain why there are so few people on the red route. **Gaps and possibilities:** How does the form of space support the information? Has the identity of space any impact on the information? Can Bob's values be more explicit?*

This is just the finding of a first scratch on the surface of evaluation that can be done. Dependant of what the goal and task of the scenario there should be a possibility to add value to the different paradigms. This is something we want to work more with. When different scales of variables or values are identified there is an opportunity to re-use the scenario blocks in new situations. This analysis and evaluation process develops in a circle movement and will be rotated round several times before an end result in more or less explicit ways.

We have not gone to any deeper depth about how a more explicit evaluation or evaluations would fit this analysis and we will leave this to further investigation, Again we would like to stress that this deliverable is focusing on the means of analyzing not evaluating, this is an area that we will explore more before we come to a valid conclusion

8 TOWARDS A TAXONOMY

To be able to re-use the information from the analysis we are attempting to create a potential language or guide for building and enriching scenarios. What we want is to be able to identify the building blocks of the scenario analysis (the building blocks that create the patterns over time).

..."it is our contention that this synergy of subjects will not mature without benchmarks against which different approaches can be compared. such benchmarks have to be designed carefully to ensure that exactly the features of interest are exercised and measured. (and compared)"[14]

We have extended the exploration to include 3 dimensional sets of the 6-dimensional paradigms to try to attempt to make taxonomy of the scenario analysis. We want to underline that this is only an initial attempt and we approach the findings with great caution. We see this as an exploration for finding an entrance to a potentially large and challenging problem space.

We have found there to be 20 sets of combinations using the paradigms of the Contextual Analysis Model, which we have named and visualized below. For the sake of the sets we have labeled the paradigms as follows:

A - Information

B - State

C - Values

D - Form of Space

E - Identity of Place

F - Interaction Archetype

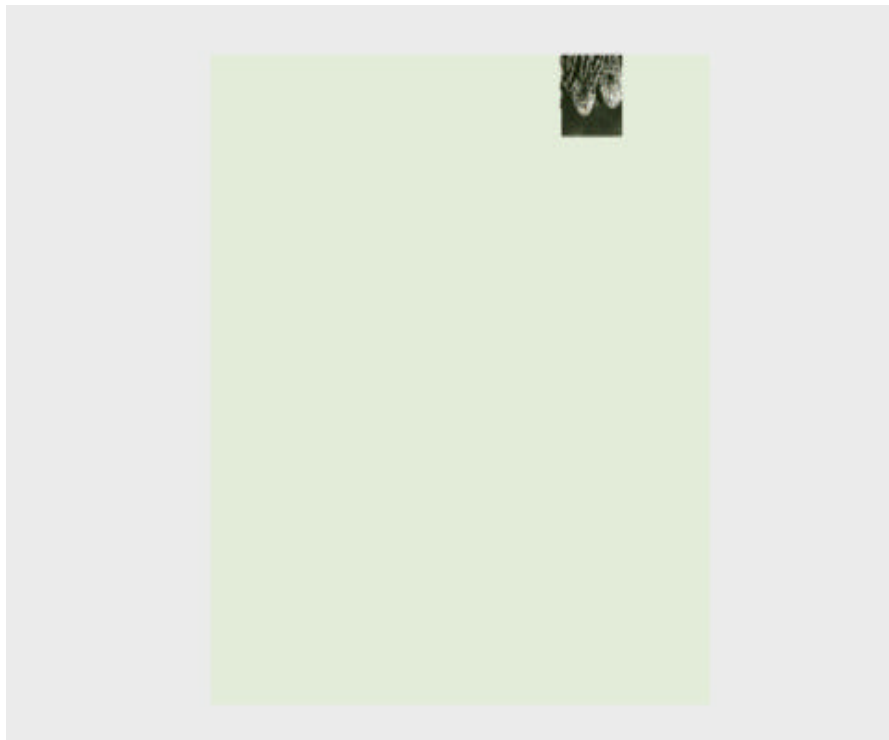


Diagram 23. Set DEF

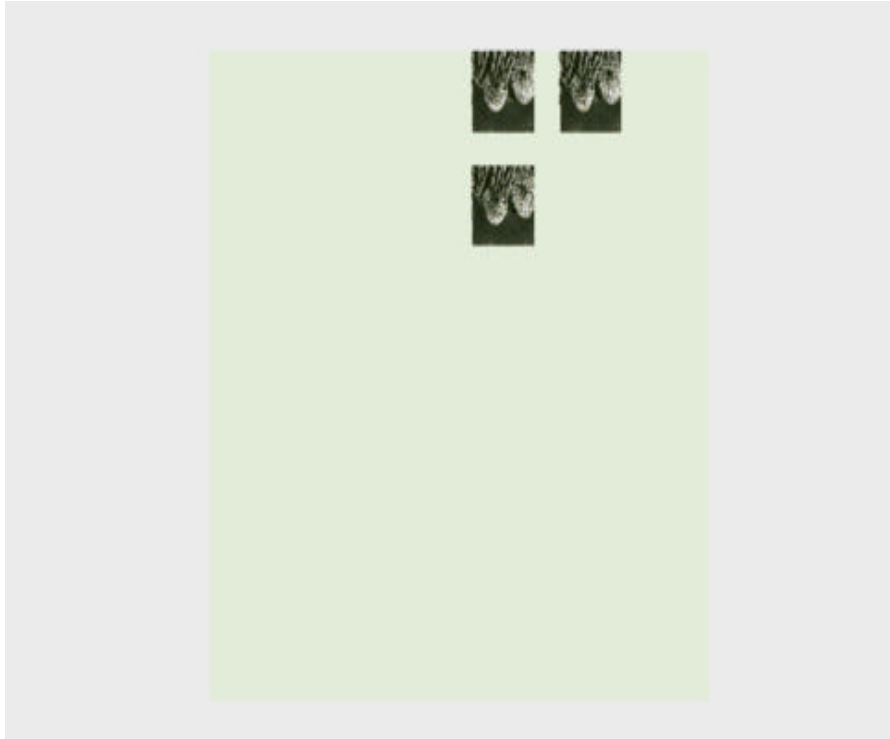


Diagram 24. CDE, CDF, CFF

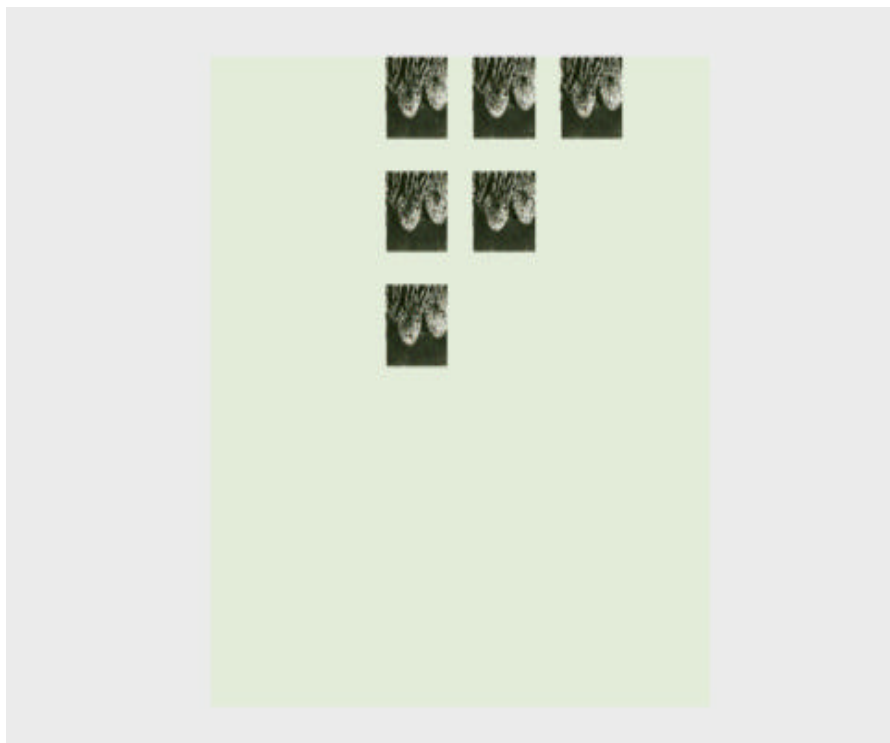


Diagram 25. BCD, BDE, BEF, BCF, BDF, BCF

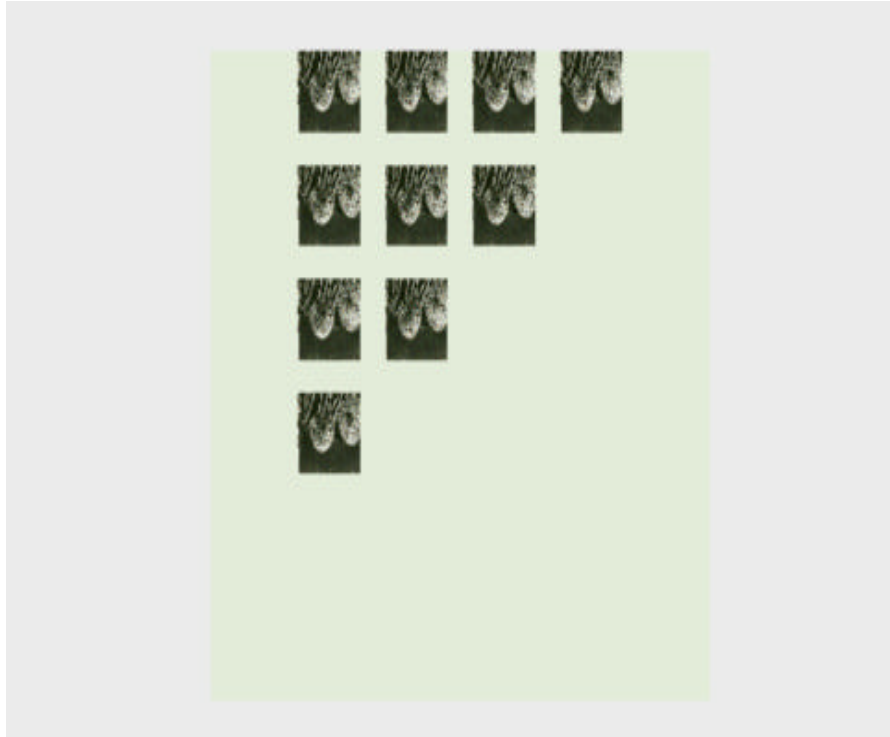


Diagram 26. ABC, ACD, ADE, AEF, ABD, ACE, ADF, ABE, ACF, ABF

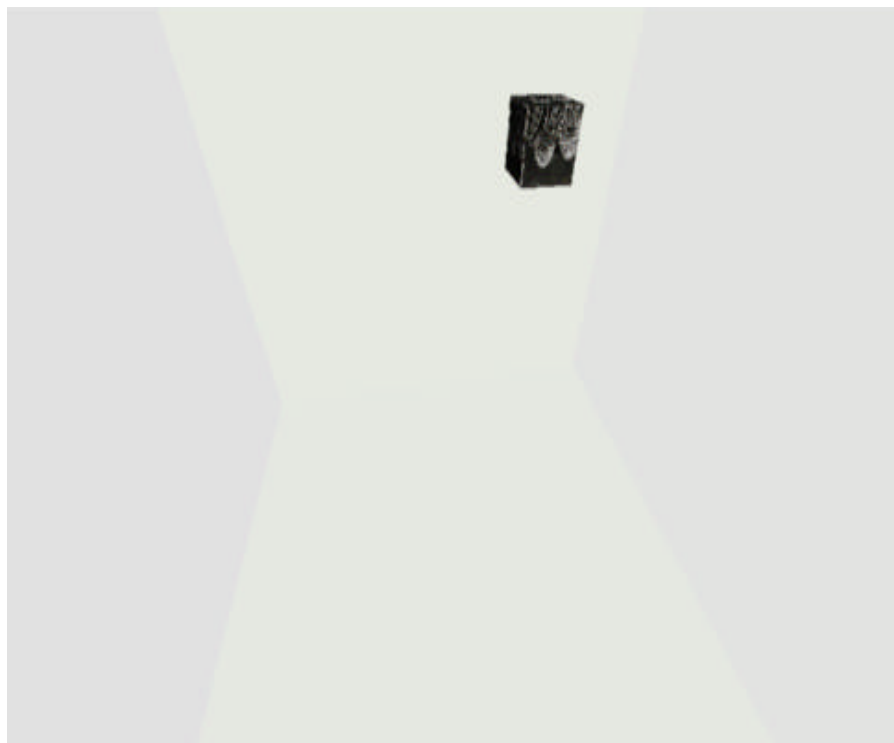


Diagram 27, 28, 29, 30, 31, 32. Three-dimensional modeling of the sets



Diagram 28.



Diagram 29.



Diagram 30.



Diagram 31.



Diagram 32.



Diagram 32.



Diagram 33.

After filling in this potential taxonomy we hope to identify the existing and missing building blocks of context and use. We have taken some inspiration from how Chemistry taxonomy got developed, where the identification of existing amalgamations left obvious gaps to be filled with unexplored materials.

The possibility to identify building blocks of scenario building for integrated spaces seems likely but needs to be further explored. The positioning of the above named sets will potential be changed since the different sets at this point are randomly added and more investigations needs to be undertaken of the casual relationships between the sets and how these are valued.

9 CONCLUSION

The conclusion of this deliverable is open ended. We have made the first attempt to analyse, visualize and evaluate sections of the scenario developed for Gloss. We have during the way found lots of interesting aspects of what we want to achieve. We have found answers to our intuition and continued path of research for Gloss and we have also been able to identify areas of continuation of research with an array of new questions and several new areas of relevance.

We divide our findings in four sections – analysis, visualisation, evaluation and taxonomy/re-use.

9.1 ANALYSIS

When we proposed the use of the Contextual Analysis Model for the development of an analysis tool for creating and rediscovering scenarios we had in mind that this analysis tool would put forward the intentions, context and need of the users. During the Gloss project the model have proven very useful as a communication tool for a multidisciplinary team to relate to both from the user and the technology perspective. The questions and lines of thought that comes from doing this attempt, using the analysis tool for the scenarios has indications of being fruitful and it has provoked us to want to look even deeper into the analysis. During the writing of this deliverable we have realised that the area of analysis for scenarios is as complex as one want it to be depending on ones goals.

9.2 VISUALIZATION

Through the use of the individual lenses we identified nodes of the paradigms in the scenario and with this also the gaps in them. Using the visualization modeling it reviled patterns of use and their relationships as we hoped it would. Looking at the relationships in the model arises the questions of their individual value and how they would be valued in different situations. This is something that is crucial to the investigation and to be able to support re-use the analysis. What type of patterns are “good” useful patterns and which aren’t. What is the difference in identification for a visualisation for a commuter from a tourist? What happens with the patterns when different variable changes and how much do they need to change to change a scenario into being a new scenario? All questions arising suggest further explorations. Visual explorations combined with an evaluation system that are particular but abstract enough to be used in several situations are crucial to the research results. In the visualisation section we have also found new research objectives about visual relationships, interpretation and abstraction.

9.3 EVALUATION

The evaluation we have made in this deliverable is about gaps and opportunities in the current Gloss scenario. We acknowledge that this section in the deliverable need to be investigated further. We have in this deliverable concerned ourselves mainly with the analysis and the visual exploration of this. What we found though is that the analysis and the visual exploration are dependant on the evaluation much more than we realised. One of the topics in evaluation that we are very eager to continue with is the notion on values of the separate paradigms.

9.4 TAXONOMY AND RE-USE

After our analysis and visual exploration we find it more possible to believe that there would be an opportunity to develop a language of different families of scenario context. To develop taxonomy for context and scenarios is a challenging and complex task and we undertake this with great caution. We project that the ability is there but we have yet to come to an understanding first with the evaluation and secondly the method of such a task. After identifying different context in family related manner we hope to find the gaps where context is yet to be put in. These will be gaps of context we still cannot foresee or imagine.

These findings of new research areas are extremely interesting outcomes from our analysis deliverable and we argue that the relevance of this research is crucial to an efficient way of scenario development in multidisciplinary teams and for complex situations. Building scenarios for such a new domain as integrated spaces would benefit if certain pieces of the context of scenario already were critiqued. This deliverable has provided an initial attempt to develop a method for scenario analysis. The Contextual Analysis Model has been our tool in this exploration and the attempt has provided us with an indication that context of analysis is challenging, but and we believe that further exploration of this attempt could lead us to a possible re-use of analysis

10 REFERENCES

1. P.Welen, A Wilson, *Design Guidelines for integrated spaces, D5, Project GLOSS, IST-2000-26070, September 2002.*
2. J. Cotaz, *Initial Scenario, D7, Project GLOSS, IST-2000-26070, June 2002*
3. Munro, P.Welen, A .Wilson, *Interaction Archetypes (Flow plan and space organization archetypes) D4, Project GLOSS, IST-2000-26070, September 2001*
4. Propp, V. 1958. *Morphology of the folktale. The Hauge:Mouton. (original edition 1928)*
5. *Greatest empirical based design method - Mock-ups. Dreyfuss,H. 1955. Designing for people. New York: Free Press.*
6. Schön, D.A. 1983. *The reflective practitioner: How professionals think in action. New York: Basic Books.*
7. Munro, *Raw observation in the strict sense of the word/Early interaction design concepts from fieldwork, D6, Project GLOSS, IST-2000-26070, September 2002*
8. *Brainstorming technique – DeBono,E. 1990. Lateral thinking: Creativity Step-by-Step. New York: Harper-Collins (originally published in 1970)*
9. *Making Use John Carroll, Carroll,J. Making Use, Scenario-based design of human-computer interactions, The MIT Press, Cambridge, Massachusetts, London, England, 2000.*
10. Hillier, B, *Space is the machine,: a Configurational Theory of Architecture, Cambridge, CUP, (1996).*
11. *Hajer &Reijndrop, In Search for a New Public Domain, NAi Publishers, (2001).*
12. *M. Lynch,Site Planning, Cambridge, Mass, MIT Press, 1962*
13. *Scriven, M. 1967. The methodology of evaluation. IN R. Tyler,R. Gagne, and M. Scriven (Eds.), Perspectives of curriculum evaluation. Chicago: Rand McNally, pp. 39-83.*
14. *Paddy. Nixon, Simon Dobson and Gerard Lacey, “Smart environments: some challenges for the computing community” in Managing Interactions in smart environments, Spreinger Verlag Press, 1999,pp1-4.*

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