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Visualization creativity workshops

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Problem-driven visualization research

- Problem-driven vis or design studies [Sedlmair2012]
  - Analyze problem faced by experts in a domain
  - Contribute visualization solutions to that problem

- Challenges
  - Understanding collaborator needs
  - Varying levels of collaborator engagement
  - Limited time of collaborators
  - Highly-specialized needs

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Creativity workshops

- Creativity workshops-- structured *activities* deliberately stimulating creative thinking

- Used extensively in software requirements analysis [Scholosser2008, Maiden2007, Maiden2004, Jones2008,…] have been shown to:
  - Establish understanding of user needs
  - Engage users through participatory methods

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Visualization creativity workshops

- Documented in only two visualization projects [Goodwin2013; 2016]
- We reflect on shared experiences of Goodwin and previously unpublished experience running a visualization creativity workshop
- Previous work described what was done and how it impacted the specific visualization project
- We provide details on *how and why* to run creativity workshops and the impact it can have on general design processes
  - Establish trust and engagement with collaborators
  - Concentrate time commitment
  - Potentially more generalizable visualization requirements

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Collective experience

- Three distinct projects:
  - Smart home energy use
  - Retinal connectomics
  - Constraint programming

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- Example for one project
  - Who? giCentre, City University London
  - Why? Identify ways to use smart home data – focused on industry
  - When and where? Sept 2012, 10a – 3p, Neutral countryside venue
  - What now? Project completed, outputs include prototype designs, insights and ideas as how visualization can benefit smart home industry

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Contributions

We propose a generalized framework for *visualization creativity workshops* based on experiences using the workshops in three diverse projects. This framework consists of four points:

1. We articulate the role of creativity workshops in existing visualization design methodologies
2. We discuss workshop preparation, including: preconditions, participant selection and venue.
3. We describe workshop activities, including: their motivation, effectiveness, materials, as well as potential modifications and alternatives
4. We reflect on how to use the workshop's output to positively influence the visualization design process

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Creativity workshops in vis design

- Design study methodology [Sedlmair2012]
  - Assume: completed the *learn*, *winnow* and *cast* phases
  - Workshops fit into the DSM's *core* phases – *discover* and *design*
- Design activity framework [McKenna2015]
  - Workshops spans from the *understand* activity to the *ideate* activity
- Nested model [Munzner2008]
  - Workshop output maps to *problem characterization* and *task + data abstraction*
- User-centered visualization design [Koh2011]
  - Workshops fit into and borrow from *problem domain analysis*

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Workshop preparation

- Preconditions:
  - Understanding of the domain problem
  - Initial data and task abstractions

- Participant selection:
  - Pre-workshop surveys [Goodwin2016],
  - Role in organization [Sedlmair2010],
  - Creative atmosphere [Isaksen2001]

- Venue considerations summarized by Dul et al. [2011]:
  - Neutral territory
  - Comfortable furniture
  - View to nature and daylight

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Methods	Summary
Contextual inquiry, interviews, …	Create tasks and data abstraction
Workshop	
Introduction	Establish creative atmosphere
Wishful thinking	Record aspirations
Constraint removal	Push beyond current paradigm
Lunch and excursion	Reflect with new stimuli
Vis awareness	Analogize to existing visualizations
Storyboarding	Summarize “a day in the life”
Conclusion	Identify key themes and ideas
Analysis	Prioritize and evaluate output

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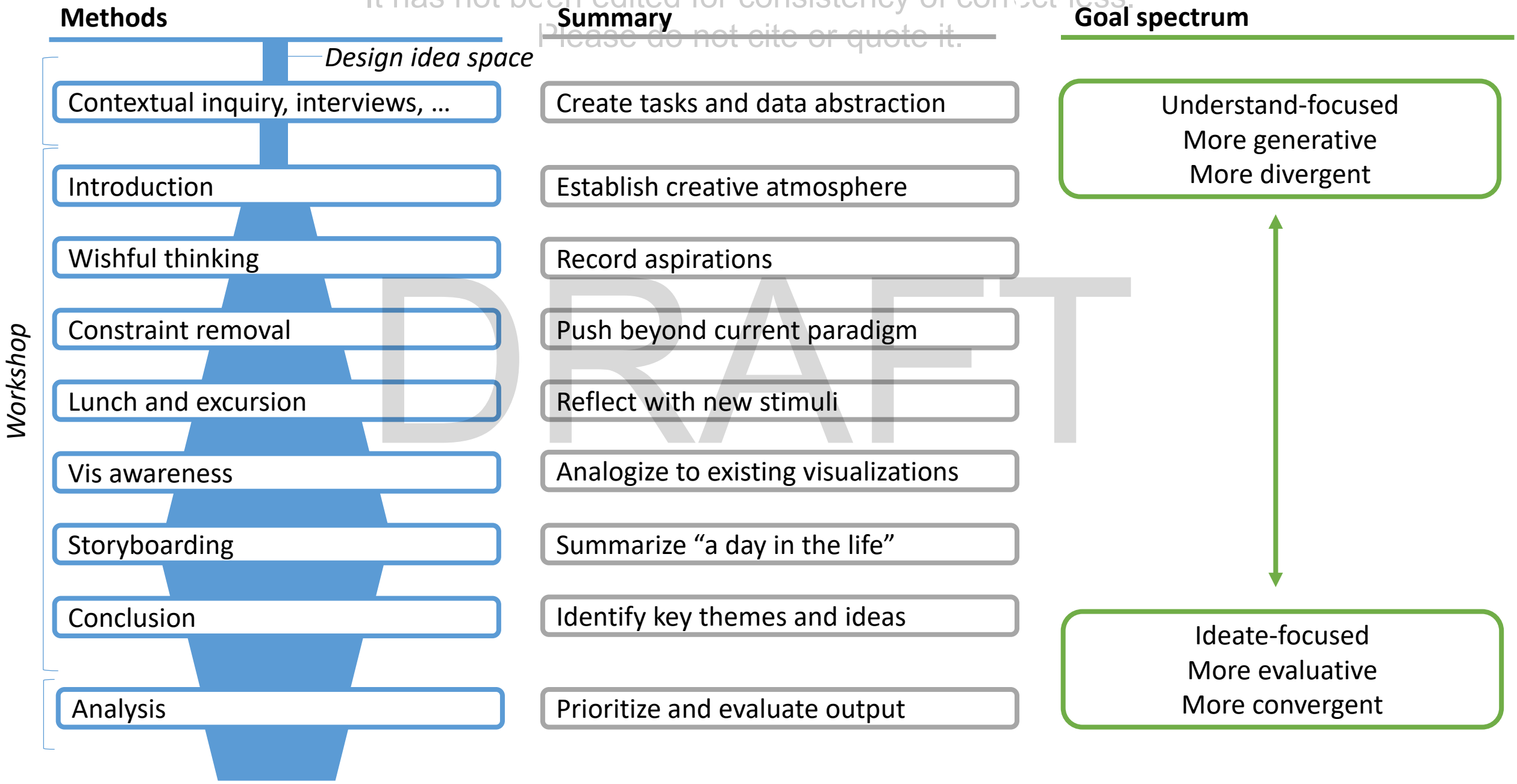

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We'll dive into one of these activities today – the paper will have all of them covered in equal detail.

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Activity – wishful thinking

- Description**:** Elicited vis-focused ‘aspirations’ from participants
  - What would you like to **know**?
  - What would you like to be able to **see**?
  - What would you like to be able to **do**?

- Output: opportunity statements recorded on post-it notes

- Vis purpose: This is a *generative* method meant to identify *opportunities* [McKenna14] for visualization software.

- Creativity purpose: A form of guided brainstorming, but with more formal prompts meant to challenge the existing thought paradigms [McFadzean2001; Osborne1957]

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Activity – wishful thinking

- Details and evaluation:
  - Duration: 50 – 70 minutes
  - Push past exhaustion:
    - Screenshots of existing tools
    - “What next?”
  - All three workshops found this effective

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- Modifications and alternatives:
  - Discussion strategy – partners vs groups
  - Love/breakup letters with current software [HBR10]
  - Persona analysis [Martin2010]

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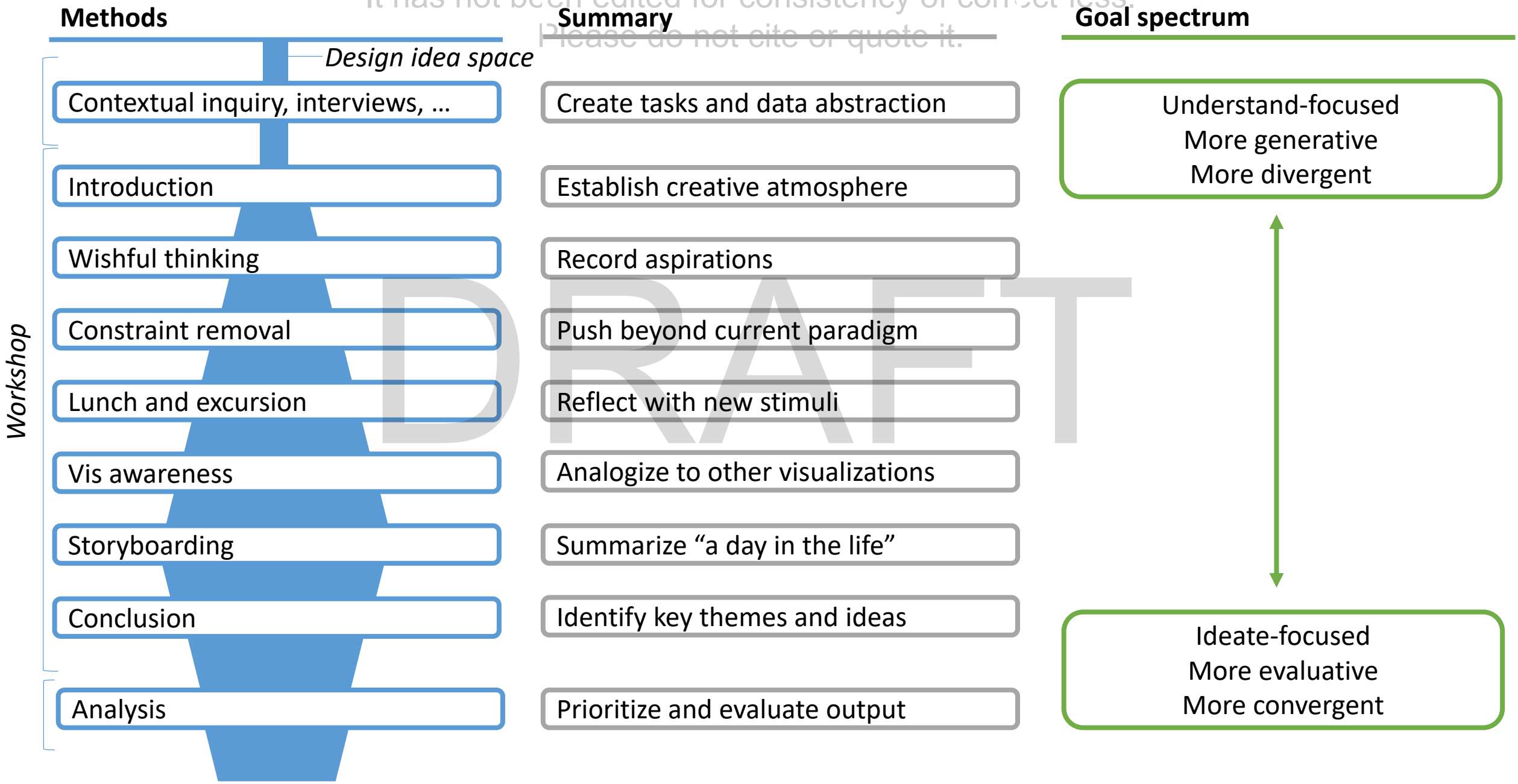

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Workshop output to requirements

- Generates a few hundred discrete artifacts—post-it notes, photographs, and drawings

- Analysis involves an open coding of ideas into key themes and tasks
  - Three projects identified ~10 – 25 themes and ~5 – 10 tasks each
  - Translator [Sedlmair2012] helps with deciphering these ideas

- Evaluated themes and tasks “ease of development” and “impact value” [Goodwin2016]

- DAF vocabulary of **opportunities, constraints,** and **considerations** was particularly useful in categorizing output, for instance:
  - Opportunity: easily query for multi-hop relationships
  - Constraint: must provide access to database IDs in order to navigate between software tools
  - Consideration: should be shareable between users/labs

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Workshops in the design process

- Opportunities are input to prototyping:
  - Design workshops [Goodwin2013]
  - Visualization exploration [Goodwin2016]
  - Prototypes influence workflow immediately [Lauritzen2016]

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- Constraints and considerations are heuristics for evaluating designs:
  - “everything in three clicks” [Goodwin2013]
  - “connect with existing tools” [Lauritzen2016]

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Discussion

- Ideas generated are not necessarily novel or creative, but that's the point.

- Rapidly generate understanding of user needs
  - 6 participants * 8 hours workshop = 48 man hours of time with collaborators
  - Output is rich and descriptive set of needs – opportunities, constraints and considerations

- Structure could still be improved
  - "Overall it was good, but a bit long and slightly repetitive" - WS #2 participant
  - "I felt there was too much time expanding and not enough focus" – WS #3 participant

- Workshops are mutually beneficial
  - "the interpersonal leveling and intense revisiting of concepts made more team progress in a day than we make in a year of lab meetings" – WS #2 participant

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Discussion

- Varying levels of excitement and participation: establish broad trust, rapport, and engagement with members at all of levels of collaborator's organization
  - *"The visualizations opened our eyes to the data we have…we need to focus on visualization more!" – WS #1 participant*
- Limited time: efficiently understand user needs
  - *"[The workshop] provided a way to stop thinking about technical issues and try to see the big picture" – WS #3 participant*
- Highly-specialized user needs: expose shared needs within collaborator's organization that can motivate more generalizable designs
  - *"I was surprised by how much overlap there was with the challenges I face in my own work and those faced by others" – WS #3 participant*

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Conclusion

We proposed a generalized framework for *visualization creativity workshops* based on experiences using the workshops in three diverse projects. This framework consists of four points:

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2. We discuss workshop preparation, including: preconditions, participant selection, venue, and materials
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Activity – constraint removal

- Description: Identify constraints or barriers to the aspirations identified in the previous activity; remove these constraints and record new sets of aspirations
- Output: constraints identified on post-it notes; new aspirations recorded after the constraint is removed.
- Vis purpose: This is a *generative* method meant to identify *constraints* for visualization software, removing those constraints reveals new opportunities
- Creativity purpose: Inspire paradigm-breaking creativity [Boden1990, Jones2008]

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Activity – constraint removal

- Details and evaluation:
  - Duration: 50 – 70 minutes
  - Effective in all three workshops
  - Push past exhaustion of previous activity
  - Varying levels of constraints identified -- some domain-specific, others limitations of vis

- Modifications and alternatives:
  - Forced association [McFadzean1998]
  - Force-field analysis [Lewin2008?]

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