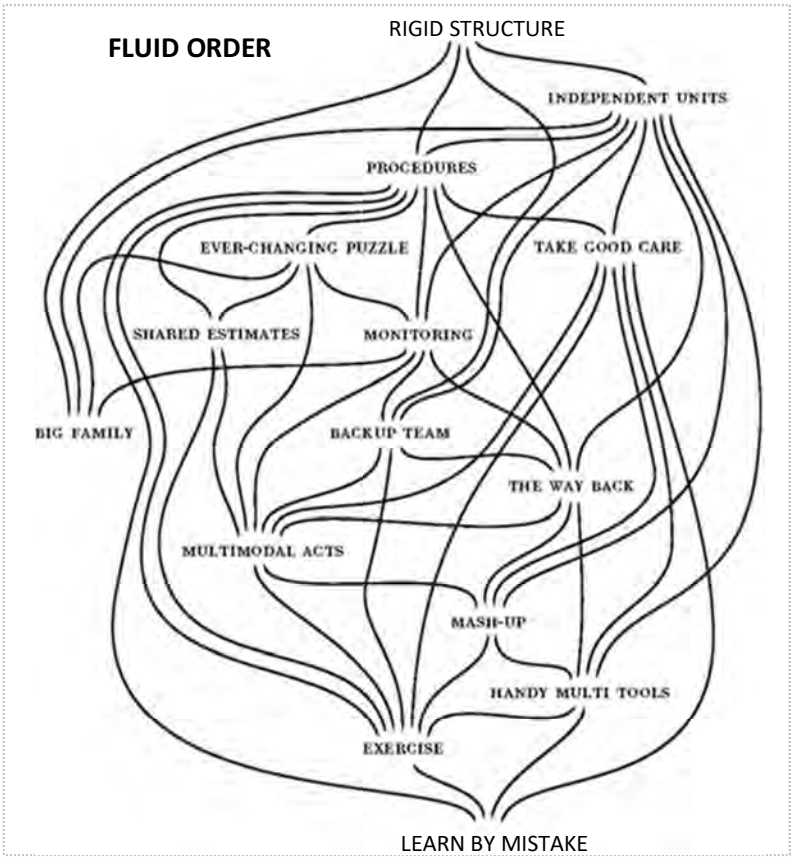
A Pattern Language of Firefighting Frontline Practice

Pattern Abstracts for a quick reference as suggested by the author.



A Pattern Language of Firefighting Frontline Practice to Inform the Design of Ubiquitous Computing - *Sebastian Denef,* 13 December 2011

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1. Fluid Order, 2. Rigid Structure, 3. Independent Units, 4. Procedures, 5. Ever-Changing Puzzle, 6.Take Good Care, 7. Shared Estimates, 8. Monitoring, 9. Big Family, 10. Backup Team, 11. The Way Back, 2. Multimodal Acts, 13. Mash-Up, 14. Handy Multi Tools, 15. Exercise, 16. Learn By Mistake

The patterns describe key practices for frontline firefighting, describing how firefighters organize the division of tasks and roles, how they deal with information in a dynamic environment, how they form social bonds, improvise, provide safety and prepare their work.

1. **fluid order**

Firefighters are called when something has gone wrong, when systems are out of control. They need to react quickly to prevent further harm in an ever-changing, life-threatening work environment.

Therefore, firefighters respond to the challenge they face in a fluid manner. They apply existing tactics and former knowledge where appropriate yet need to be aware of the uniqueness of the incident and change the operation according to the situation at-hand. The incident shapes the operation and the operation is shaped according to best practices and experience.

2. **rigid structure**

Firefighting operations face unknown, often chaotic situations. Nevertheless, firefighters have to act promptly and decisively.

Therefore, a rigid organizing structure forms the backbone of the operation. Roles are clearly defined and visible, allowing everybody to see who is in charge at different levels. Beyond fixed roles and hierarchies, the structure serves as a means for mutual responsibility and trust.

3. **independent units**

As a result of the extreme conditions of the environment, frontline firefighting is an isolated activity. The perceived situation in a burning building is so eminently unique that others cannot put themselves into the position of the individual working on the frontline. This makes it very difficult to give detailed top-down instructions in a ***RIGID STRUCTURE*** *from outside.*

Therefore, small work units of two or three firefighters work very close with each other and only receive general missions. Detailed decisions are left to the unit itself.

4. **procedures**

Firefighters need to react promptly; after the arrival on-site, there is only so much time to decide what to do. With a ***RIGID STRUCTURE*** *they know*

*who is in charge, now the problem is about deciding how to act. Additionally, they have to act collaboratively and even as **INDEPENDENT UNITS** need be mutually aware of what they are doing.*

Therefore, firefighters rely on a set of procedures that define how to react and the next steps to take.

5. ever-changing puzzle

*An incident changes continuously. As early impressions could be incorrect, appropriate reactions and **PROCEDURES** require taking emerging information into account.*

Therefore, firefighters join information from different sources. They gather information from bystanders, people in need, existing knowledge about the incident site and frontline teams. Commanders work on aligning chunks of information to make sense and to form an overall picture of the situation they are in.

6. take good care

*Even when following **PROCEDURES, INDEPENDENT UNITS** are not necessarily safe. On the one hand, the environment might radically change within bursts of a second and pose immediate threats to the firefighters. On the other, the actions of firefighters could lead to new life-threatening conditions.*

Therefore, firefighters always await the unfortunate thing to happen and take means to prevent it. They constantly consider what would happen in case something goes wrong. Thereby, they are prepared for the unforeseen, keep a high level of attention to the environment.

7. shared estimates

*Firefighters need to share information with their peers as part of the **EVER-CHANGING PUZZLE**; they need numeric figures to make decisions on technical equipment. However, they lack information and do not have precise measurements.*

Therefore, firefighters need to get comfortable with numeric information, produce estimates that size the environment and can be shared.

8. monitoring

*Firefighters might face situations where sudden changes and threats put them in danger and they need immediate help. Those situations need to be recognized. Especially with **INDEPENDENT UNITS** it is difficult to ensure that emerging threats are identified in time.*

*Therefore, firefighters monitor the operation and thereby gain an understanding of what is going on now in the context of what has happened before. More than a mere **PROCEDURE**, monitoring means caring for others and fulfilling an expected obligation.*

9. big family

*In a firefighting operation with a **RIGID STRUCTURE AND INDEPENDENT UNITS**, tasks and roles have different characteristics and require different skills. It is however necessary for firefighters to work jointly on an **EVER-CHANGING PUZZLE** and to interpret their and others' situations in **MONITORING** to make mutual sense of the shared information.*

Therefore, firefighters form a close team in which seniors and subordinates know each other well, as a big family. They train people for senior positions but ensure that everybody is aware what the others are doing and that they have empathy for each other.

10. backup team

*As **INDEPENDENT UNITS**, firefighters might face situations out of which they cannot lift them selves. In these cases of emergency they need immediate outside help. Other colleagues, however, might be busy with their own tasks and therefore could not be available for quick support.*

*Therefore, firefighters have backup teams on standby that are solely delegated to provide support to **INDEPENDENT UNITS** who are in trouble on the frontline.*

11. the way back

When engaging an operation in an unknown, dangerous and dynamic environment, firefighters might face difficulties they cannot solve in the limited time they have.

Therefore, firefighters always make sure to have way to return to a safe place. They therefore mark the way that they follow as a path that they know to be safe. They usually use this path to return. This path also works as a way for a backup team to find the teammates who need help.

12. **multimodal acts**

Working in rooms full of smoke, firefighters have difficulties in grasping the environment visually.

Therefore, firefighters use all of their senses to feel the environment around them. They rely on tactile feedback from different parts of their body; they look for visual cues, feel the temperature and listen for sounds.

13. **mash-up**

While the situation on-site is difficult to predict and firefighters need to ***TAKE GOOD CARE,*** ***INDEPENDENT UNITS*** *are only able to carry so much equipment to the frontline; each additional tool has to be lifted by an already heavily loaded firefighter.*

Therefore, firefighters make creative use of the environment around them. They look for alternative uses of the things that they find along the way. The environment becomes a grand collection of potential tools to be mixed with existing procedures and tools.

14. handy multi tools

Firefighters frequently face problems that require special tools. Physical constraints and time constraints make it impossible to have all the required tools at hand as ***INDEPENDENT UNITS*** *can neither lift additional load nor have the time and energy to go back to the engine, instead they need to* ***MASH-UP.***

Therefore, firefighters bring tools that can be used for different purposes and invent new ways of using the tools. Tools are designed open for new uses and can be combined with the environment.

15. **exercise**

Even firefighters do not fight fire all the time. Serious fires are rare. Firefighting missions are one-shot operations, as failures in these interventions can cost lives.

Therefore, firefighters need to train their work over and over again. Thereby they have opportunities to exercise the different aspects of firefighting work practice. Exercises are designed in ways to both include standard procedures and expected exceptions.

16. **learn by mistake**

After all, in interaction with hostile and dynamic environments, mistakes are made and unfortunate things happen. ***PROCEDURES*** *and* ***EXERCISE*** *may not incorporate all the possible exceptions that could occur.*

Therefore, firefighters use operations with accidents or near-accidents to identify the weak spots in the existing practice. They use the analysis of failures as a way to reflect on existing procedures and improve them, respectively. Firefighters prevent future accidents by learning from mistakes made in the past.

From Separate, to Increasingly Ubiquitous idea of the relationships between the person and the world - ed.