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ORGANISATIONAL CHEMISTRY: NATURE'S ORGANISATIONAL MODEL FOR BUSINESS

Jim Fisher*, Jenny McGill**

Abstract *Many methods have been developed for organisational change, depending most often on a one-time grand event to bring change. While these events take and produce initial energy, employee engagement oftentimes is not sustained. Earth's nature provides key examples of interrelated stable systems, such as the water cycle and independent ecosystems, which should be harnessed for use for organisational development. No current organisational model or system adequately demonstrates the same power that bonds between atoms in a molecule do. Following the examples in the natural world, connections between people in an organisation can be augmented and strengthened, leading to more adaptable organisations. This conceptual sustainable method herein described involves an intentional matrix of pairing employees in an organisation to create or strengthen the connections and communication between them. The key design elements are offered along with a model of how facilitation would be implemented. Based on principles from the natural world, this organisational chemistry method allows companies to develop stronger employee bonds and sustain long-term growth, change, and adaptability.*

Keywords: *Organisational Behaviour, Organisational Theory, Organisational Chemistry, Organisational Change, Organisational Model, Organisation Development (OD)*

INTRODUCTION

In nature, a single atom is constantly searching for a more stable form by attracting valence electrons to itself. The strength of this attraction is termed 'electronegativity' (Jensen, 1996). Different electronegativity strengths roughly correspond to different types of atomic bonds. The strongest atomic bonds are ionic, covalent, and metallic. Ionic bonds are formed by an atom 'giving' an electron to another atom. This results in a net positive and negative charge on each atoms, and as a consequence, they are attracted to each other like opposite poles of a magnet (Pauling, 1960). An example of a material created by this bond is table salt (NaCl). This bond correlates with the human experience of giving something to another. Whether a physical thing, time, or an item that both perceive as having value, a bond between the giver and receiver is created.

Covalent bonds are formed when two or more atoms 'share' an electron so that they both have a full outer shell (Miessler & Tarr, 2004). Examples of this in the chemistry world are hydrogen molecules (H_2) or methane (CH_4). Macromolecules such as polyethylene and nylon feature covalent bonds. The human experience has a correlation to this when people share knowledge, experience, love, an attitude, or something else they find in common with each other.

A third type of bonding among atoms is metallic bonding, which occurs when a matrix of atoms share the electrons among the whole structure. Paul Drude used the term 'sea of electrons' to describe this phenomenon (Drude, 1900). Materials with this bonding have excellent thermal and electrical conductivity. This type of bonding can compare to the human experience of working for the same company (sharing resources) or living in the same community or nation.

While the atom looks for the most stable number of electrons in its outer shell, these electrons can only come with a corresponding atom. A molecule formed is usually more stable than the atoms used to create it. Carbon is a prime example of this. It is difficult to find carbon in nature as a single atom. It is always combined with something, even other carbon atoms. Weak carbon bonds lead to a soft material like graphite, which is easily abraded and broken apart. When the carbon bonds become stronger, the material is diamond, which is the hardest natural substance found in nature. Carbon is also unique in that it can bond repeatedly with itself. Increasingly complex carbon molecules lead to gases like methane and propane, then to liquids like alcohol, and finally, to solids like proteins and DNA. Similar to what chemical bonding evidences, the growth of social media has shown that a tremendous

* EMOD, Bowling Green State University, Ohio, USA. Email: jim@bgfishers.com

** Dean, Indiana Wesleyan University, Merrillville, IN, USA. Email: j.mcgill@fulbrightmail.org

desire for individuals to develop and maintain connection exists.

One can easily observe natural organisations in the world. From the organisation of molecules to natural rock formations to the ecosystem of a coral reef, complex organisations are comprised of simple structures. Simple structures are used repeatedly in fractal patterns to create complex and beautiful objects. Nature has already made the patterns on which materials and organisms are modelled. Rather than a hierarchy of levels, from one entity to the other, the hierarchy of nature is that larger structures are made of smaller ones. A diagram of a biological organisation is shown in Fig. 1. Notice that rather than each level of the organisation 'controlling' the preceding level, the smaller structure is instead incorporated into its very being. A lion includes its organ systems; the organ systems are made from the individual organs, down to the very atoms that make up all matter.

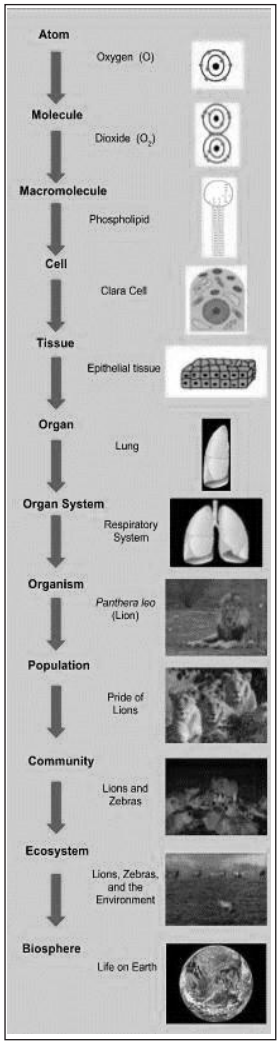

Fig. 1: Biological Organisation[1]

[1] https://commons.wikimedia.org/w/index.php?curid=26262662

Within the field of organisational development, models are very useful for creating a visual representation of an institution. Visual representations help enhance the understanding of an organisation. Initially, models were focused on the factors within an organisation. For example, one of the earliest models is the Leavitt model (1965). It presents four factors that influence the dynamics of an organisation: task, structure, technology, and people. The model proposes that each of those elements is interdependent and able to be changed. The organisational chemistry model begins with the premise that just as atoms make up matter, people comprise the organisation. All the factors that influence the people are dynamic and are not independent. In fact, forward thinking companies can include customers, suppliers, and other people who influence it into the method so that external factors can be recognised and incorporated.

External factors are the focus of the open system model. This model states that an organisation receives input, either informational or material. The business transforms this input into an output, which is reintroduced back into the environment. The environment provides feedback to the organisation, which will use it as further input to adjust its transformation processes to meet the environmental needs. The open systems model can be applied on many levels. While this model is descriptive of the interaction between an entity and its environment, it is a high-level view. The organisational chemistry method acknowledges these transactions and leverages them to improve the inputs, processes, and feedback of the systems of the organisation.

There are subsequent models for understanding organisations. From the Leavitt model, the McKinsey 7S model was created (Waterman, 1980). Weisbord's Six-Box model (Weisbord, 1976), Tichy's TPC framework (Tichy, 1983), and most recently, the Burke-Litwin model (Burke, 1992), offer increasingly complex descriptions of the factors and interactions within an organisation. The models try to reconcile the open system model with the sophisticated and dynamic factors within the organisation. Ultimately, they treat an institution as though it is an organism. This approach is very helpful. The biological systems of an organism must be healthy if the organism is to thrive. The organisational chemistry model recognises that we can look even deeper, and there are more intricate components of the systems that support the organism. Focusing on the smallest entities and their interactions enables the whole to stay healthy and able to help facilitate large-scale changes that are necessary to thrive in a constantly changing environment.

Human organisations are more similar to natural organisations than organisational theories have discussed in precedent literature. Businesses and non-profit organisations evolved from natural tendencies to accomplish things that a single person could not achieve alone. In nature, structures

on a molecular level grow outwards from a central core. While they tend to grow in patterns, they always extend from a core structure. Human organisations should be viewed as extending from a central core outwards, rather than top-down (see Fig. 2). Each level of the organisation is created from the smaller units it contains. By connecting people within the organisation, its structure is tightened and strengthened. Stronger organisational bonds, as in nature, are more difficult to break apart, whereas ones with weak bonds fracture easily.

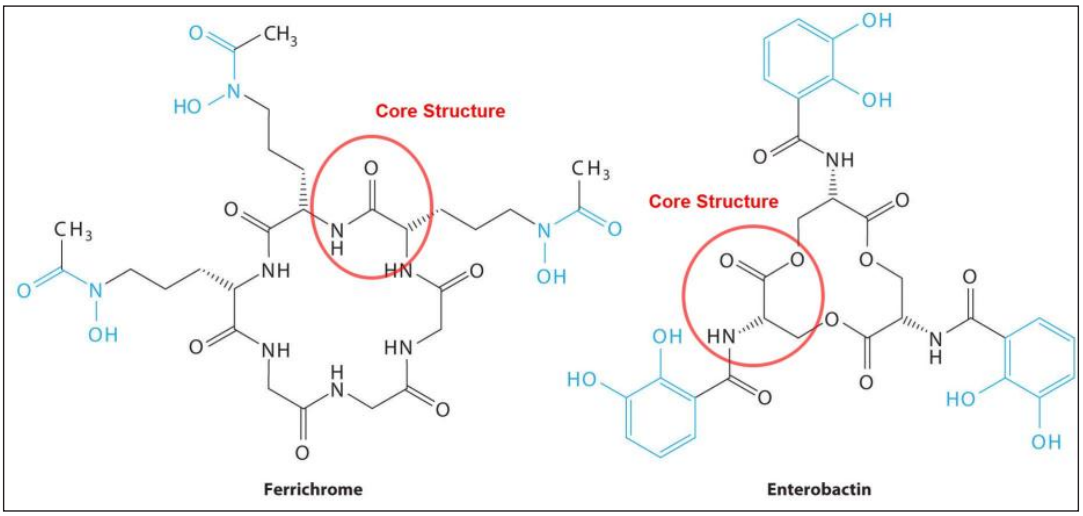

Fig. 2: Core of a Complex Molecule[2]

[2] https://commons.wikimedia.org/w/index.php?curid=2626266

During the evolution of an organisation, change is necessary. Occasionally, these changes need a concerted effort involving the whole organisation. One of the earliest models of change was described by Kurt Lewin. Lewin describes the initial system state as being frozen and unable to change (Cummings, 2015: 22-23). Three steps are then necessary for change: unfreezing, movement, and refreezing. It is a common belief that an organisation will reach a state of equilibrium which is resistant to change. Therefore, an event is needed to upset this equilibrium and motivate the system to move to a new desired state. Once that state is achieved, the system can be 'refrozen' so that the new state becomes permanent.

Other change models have expanded on this sequence by providing more detail as to how the steps are achieved. The action research model and the positive model are two that echo the Lewin system, but they focus mainly on how to achieve the 'unfreezing' of the system and leave the moving and refreezing steps to the organisation itself (Cummings, 2015: 24-27). In 1995, the *Harvard Business Review* published an article by John Kotter titled 'Leading Change'. Kotter describes the pitfalls of organisational change and proposes specific steps to successful change. These steps easily correlate to the steps of the aforementioned models.

Many organisations have held large-scale events to facilitate change and strengthen the organisation. They have been successful, as exhibited by publications such as *The Change Handbook* (Holman et al., 2007). Resistance to change is formidable, however, and the aforementioned change formula D x V x F x S > R indicates that all four factors (desire, vision, first steps, and sustainability) must be higher than zero to achieve permanent change. Large-scale events result from the desire for change and can be very effective in addressing the company vision and its first steps to achieve better organisational cohesion.

During a large-scale event, strategies are developed, action items identified, and the energy among participants is at a peak. Employees see and create the vision and new direction that the company will be taking. After the event, how long does it take until these heightened energy levels return to their lower state? Certainly, the organisational energy may be higher than before the event, but how can this momentum be sustained? Attendees have met and communicated with other employees in the organisation. They have realised that possibilities beyond the current state exist. A system to capture this momentum and drive it forward is needed so that the connections between the members are maintained and improved.

The organisational chemistry method is the devised plan to sustain this energy. It builds on the large-scale event which introduced organisational members (to a few other members in depth, or a lot of other members briefly). By assigning a small amount of time each day for members to spend with each other investigating their roles, procedures, and visions, they will be able to sustain the large event's energy for a longer period.

This method addresses the sustainability aspect of the change formula (Cady et al., 2014). Sustainability is a critical consideration in the world today. There have been methods that can maintain sustainability, such as the Six Sigma (Holman et al., 2007: 465), but these tend towards a process of continuous improvement through monitoring rather than a true dialogic method. By describing the present, finding common ground, and identifying opportunities to make organisational improvements, the organisational chemistry method roughly parallels future search (Holman et al., 2007: 316-330). Future search derives its theoretical basis from Trist and Emery, developers of the search conference. One of the main principles of future search is "instead of trying to change the world or each other, we change the conditions under which we interact. That much we can control, and it leads to surprising outcomes" (Holman et al., 2007: 326).

The model specifically calls for members to spend thirty minutes to an hour at each other's work station to investigate what they do and how they perform their job. They spend further days investigating what they have in common, how they can help each other, and discuss any topics requested by management. While power dynamics must be considered, seeing the other team member's environment can lead to much deeper observations about what they share in common or how that person can be helped. At the end of the week, they submit a joint report summarising their conversations and ideas. In dialogical fashion, this dyad is then coupled with another pair, and together they repeat the process. This process can be repeated or reset so that different members throughout the organisation are paired.

This process is similar to atoms bonding together, thus the name, organisational chemistry. After two people have formed a 'small molecule', multiple molecules can be bonded to create even more complex molecules, making the structure (organisation) stronger. The strength of each bond will vary, since pairs will coalesce with differing degrees of success; however, by introducing new pairs or reassigning the pairs after one week, new bonds will be formed for the organisation. The six design elements of the organisational chemistry model are explained next, followed by a description of the circumstances under which this model should be used ideally.

THE DESIGN ELEMENTS

Purpose

Atoms, while having no innate consciousness, serve a greater purpose. They are the building blocks of matter, and from this matter, the entire universe is formed. People also serve with purpose. Some people serve to help the differently abled; some people create great works of art that inspire others. Others educate the young. They serve as examples, building a higher entity. Whether one's purpose is inspiration through art, education of others, serving the differently abled or the sick, their purposes are realised through their effects on other people. Individuals do not live in a vacuum. Interactions with others are necessary to accomplish meaningful lives.

Organisations also have purposes other than to simply exist as an entity. Most have statements of purpose, missions, and/or visions. Individual members can unite under this organisational calling. Within these organisations, processes and systems purposefully help the members perform tasks in a systematic and efficient fashion so that the overall organisational goals are accomplished. Additionally, organisations need to change. Systems and processes facilitate change, but their existence also can create resistance to change among members accustomed to certain ways of executing tasks. Humans are well-known to be creatures of habit, and regular patterns provide comfort and stability in a constantly changing world of unknowns. Retreating into habits which produce expected results is comfortable and gives us the illusion of 'safety'. How can organisations break through this resistance to change?

The original Beckhard-Harris Change Model (D x V x F > R) provides the answer. The formula states that desire (D), vision (V), and first steps (F) are needed to overcome the resistance (R) to change. Later, sustainability (S) was included to account for continuous improvement, since nearly all change initiatives involve multiple adjustments over time (Cady et al., 2014). While large-scale events may provide both vision and first steps to organisational development, the organisational chemistry model provides a specific method to maintain the sustainability of change. Sustainability is critical for an organisation to learn how to adapt to their changing environment, to remain viable.

Allotting a small amount of time each day for members of the organisation to interact with those whom they normally would not fosters the development and strengthening of bonds among said members. The members and the bonds among them actually comprise the organisation, much like how molecules comprise an organism.

System

Similar to the DNA molecule (see Fig. 3), called 'blueprint of life', organisations are complex entities. Many different departments or functions at first appear independent, but in reality, affect each other. For example, one might think the maintenance department is independent of the shipping department. When production or machines are not available due to repairs, one can surmise how these departments are related. What would the research department have to do with a scheduler of manufacturing operations? When one considers how test mixes need to be made and orders need to be produced, the connection is clear.

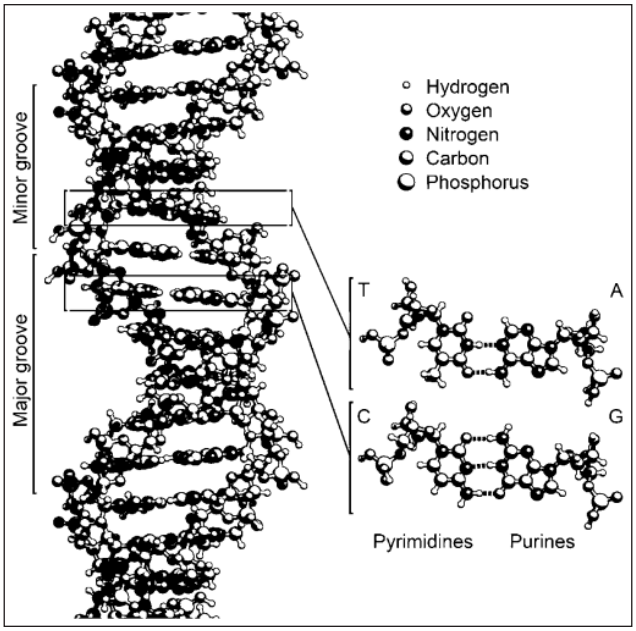

Fig. 3: Part of a DNA Strand[3]

Understanding that all the functions of an organisation are related is important to sustained change. The next step is getting the disparate functions to communicate well with each other. The organisational chemistry model focuses specifically on facilitating enhanced communication among members of differing departments. The example of manufacturing organisations is provided, but this method applies to other types of organisations. This method is suggested to be used within a single facility to minimise travel time between departments. This increases the time available for the critical element of the method: communication. Utilising virtual digital networking is a possible way to overcome the travel time limitation, but in-person contact, as a superior way to create 'real' bonds, is paramount. While recommended to be used throughout the entire facility, the model can also be used within a single department.

This model is designed for repeated periods of interaction over time, and it is judged most successful when implemented after a large-scale event. During the large-scale event, communication and engagement are commenced, and the members are receptive to the idea of continuing dialogue and cooperation. Members should understand the organisational chemistry model as a natural extension of the large event. If a large-scale event is not held prior to use of the method, confusion as to its purpose might ensue. Proper explanation and coaching allows this method to become part of the institutional culture and promote the strengthening of bonds among members of the organisation.

[3] https://en.wikipedia.org/wiki/DNA

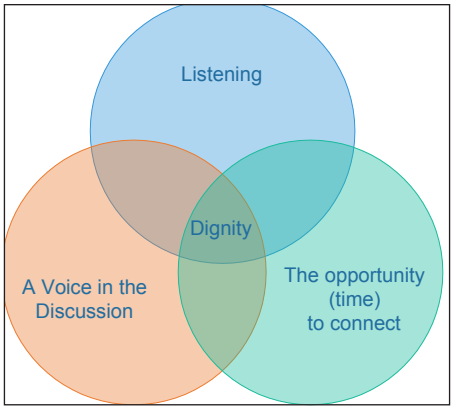

Fig. 4: Values Diagram

The primary goal is for the organisation to develop its own internal chemistry, as part of its culture. Managerial leaders should be required to participate to increase their bonds within the organisation. As overall communication is enhanced, new ideas will spread more quickly, with management being included in how the organisation could or should change. To reiterate, an organisation is both the members and the bonds among them, so the core leadership of the local executives or management must participate for any change method to be effective.

Journey

While the basic structure for the organisational chemistry model is simple, it leaves a lot of flexibility to be tailored to the unique situation and needs of the organisation. Prior to embarking on this journey, the members of the organisation should be informed of the course of events and steps of the model. A preliminary training session, which explains the process and meeting goals, should be held. The most opportune time to do this would be near the end of a large-scale event, although it is not strictly necessary. The first step is to identify a facilitator. This facilitator is more than a typical meeting facilitator; this individual is the organiser. They determine the pairs and the topics that the pairs are encouraged to discuss on the final day of the week. The pairs should normally be selected at random, but might be predetermined, for example, if there is a vested interest in improving the communication, or bond, between two particular departments or two particular people.

The basic structure of the model occurs over a week. At the beginning of the week, each member of the pair is notified who their partner will be. This information will include the partner's name, location, and contact information. Each person should contact their partner prior to the meeting to verify that they will not be out of the office during that time and to determine who will visit the other's work area first. The meetings between the two partners should be geared for

thirty minutes each day, preferably at the end of the day or the very beginning of the day.

A total of five meetings, one on each day of the week, with specific meeting goals will be held. The first two meetings are for each person to explain their role in the organisation and give an overview of the main procedures they perform to fulfil that role. Each person visits the other's work area on consecutive days. For example, Jen from accounting and Larry from the quality assurance department are paired. Each day, the host will do the explaining. The visitor is encouraged to ask clarifying questions. The visitor will keep general notes on the record sheet (see Appendix I).

On the third day, the partners meet to discuss what they and their roles have in common. This may be difficult at first, but if the details of the job are not common, then the team should look at higher-level themes, purposes, and outcomes. For example, if Jen and Larry cannot determine their shared procedures, then their attention to detail might be a common theme. The pair will record their discoveries on the record sheet.

On the fourth day, the pair reconvenes to explore if either could help the other to accomplish their goals and in what way(s). This could result in more efficiency or better communication to perform their procedures more easily or to aid in being more connected to the organisation. For example, Jen might see that Larry does not receive a communication from accounting when service contracts are due. She could offer to look into making this more of an automated process for him. Larry might come to realise that Jen does not receive notification when an order is put on hold because of a quality issue. He could look into adding the accounting department to the notification list. These discoveries will be recorded against Day 4 on the record sheet. Finally, on the fifth day, the pair will meet to discuss the topic(s) assigned by the facilitator. This topic would be a pertinent organisational issue, such as improving work safety. The two will discuss the issue and record their thoughts on the record sheet. The record sheet is returned to the facilitator for collation.

The facilitator will then decide for the next week that either the pairs will be reset or combined. Resetting pairs means that new partners are identified, and the process is repeated, similar to the first week. Combining pairs means that two pairs from the first week are combined into a four-person team, consisting of two of the teams from the prior week. If pairs are combined, the newly formed groups are issued new record sheets with the same topic as the previous week. The sequence is repeated, with days one and two used for explaining jobs and roles, the third day used for exploring what they have in common, the fourth day used for exploring how they can help each other, and the fifth day used to discuss the assigned organisational topic.

Groups of four can be further combined into groups of eight, if desired, although the amount of time allotted will be increased in order to accommodate the larger discussions. Otherwise, the groups can be reset into different pairs for the following week, with new or repeated topics. This process can be used repeatedly. As this process continues, it becomes part of the institutional culture, with members continually exploring the workings of the organisation, and discovering and strengthening new bonds to make it stronger.

Values

Values guide model development. In organisational development, especially dialogic methods, the methods utilised advocate democratic principles. Examples of these principles include transparent communication, the importance of all voices in conversation, participation, and inclusion of all stakeholders. Unique passions and values drive individuals to devise new methods, which gain interest from and implementation by others over time. In this way, methods become refined and more effective.

Three core values, as displayed in Fig. 4, are demonstrated in these organisational conversations: listening, participation, and connection. The first value of listening opens the employee to new possibilities. Instead of merely a corporate transaction, two engaged employees can have a moving experience, sharing together. Secondly, recording themes of the discussions is the first step in encouraging employees to offer their ideas for beneficial change. Dialogic methods are to explore and encourage the possible to happen. Lastly, forging relational connections among employees creates and strengthens organisational bonds. Employees become more invested in their organisation. At the intersection of these values is human dignity. Through the building of bonds and exploring the opportunities to strengthen them, employees can develop both personally and professionally. Ultimately, the organisation will improve, but it must begin with individual employees and the personal connections among them.

Principles

In contrast to the four principles of marketing (product, place, price, and promotion), the organisational chemistry model employs the four principles of solution, access, value, and education, forming the acronym SAVE (Ciotti, 2013). Instead of offering a simple product for use, organisational chemistry is offered as a flexible solution. Organisations interested in transforming themselves into future-thinking and learning entities are interested in sustainable methods for change. By creating a container for small but significant employee interactions, both in timeframe and the number of resources needed, this method facilitates continual and

steady transformation over time. While it is best used within a single facility with groups of any size, with the use of virtual meetings, it could be adapted to a multi-facility organisation.

Secondly, instead of the marketing principle of placement, organisational chemistry focuses on accessibility. With no setup fees or need for an external facilitator or large meeting space, organisations can employ this method readily. The method can be described on websites, social media, and organisational resource pages. Considering the third principle of value over price, what is the value of transforming an organisation? Incorporating values is one of the core elements of organisational development, of which improving organisational connection is key. Potential bonds already exist within an organisation, but they need to be intentionally fostered. Lastly, promotion implies an 'interruption' strategy of marketing. Organisational chemistry practices an educational delivery, offering the organisation and its employees an opportunity to promote its core values and develop new practices.

LIMITATIONS AND ASSESSMENTS OF RELIABILITY AND VALIDITY

While experience, knowledge, theory, and examples support this conceptual model, the organisational chemistry method needs to be tested in an organisational environment, to gather data for an assessment of its reliability and validity. Surveys and focus groups of participants can be utilised to provide feedback on defined variables.

As an example of this model's efficacy, Kyle Elfring (2016) provides a direct example of the organisational chemistry method working in an unstructured manner. Elfring states that he later realised he was involved with such a method. While discussing issues in a feedback session, he and his colleague discovered that a software tool could be used by both of them. Indeed, with some modifications, the tool could be utilised by the entire organisation. The proposed organisational chemistry model fosters similar interactions within an environment that promotes collaboration.

CONCLUSION

The organisational chemistry method addresses the sustainability variable in the change formula. In nature, structures are strong if the bonds between their components are strong. For example, if the bonds between the atoms of a molecule are strong, the molecule will withstand a high amount of energy that tries to pull it apart. If the bonds are weak, then the atoms can easily be detached. Furthermore, a single atom is not very stable. Atoms look to share their electrons with other atoms in order to form a molecule, which is more stable, such as oxygen found most often as an oxygen molecule (O_2) rather than as a single atom.

By applying this chemistry principle to organisations, their stability and transformation into a learning organisation can be improved. The method specifically involves connecting members for short amounts of time over the course of five days to explore their roles, procedures, commonality, and coordination. If the organisation commits to repeating this pattern in the long term, then its sustainability will be improved. The method is designed for perpetual repetition, by combining different pairs into quartets or resetting the pairs, so that new bonds are formed across the organisation. The five design elements of purpose, system, journey, values, and principles were described to explain the core philosophy of this method. In addition, the marketing strategy of SAVE, rather than the four typical principles of marketing, was conveyed. Finally, a hypothetical user experience was related to demonstrate the process and intended effect of the method.

APPENDIX I

ORGANISATIONAL CHEMISTRY RECORD SHEET

Team Member #1: _____

Department: _____

Team Member #2: _____

Department: _____

Day 1: Job Role & Procedures "Tell me about what you do."	
Day 2: Job Role & Procedure "Tell me about what you do."	
Day 3: "What do our jobs have incommon?"	
Day 4: "How can we help each other?"	
Day 5: Topic and Feedback for Learning "Let's discuss..."	

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