# Building a knowledge network

By Christin Wiedemann, March 2017

## Abstract

In today's rapidly evolving technology society changes are too frequent for us to be able to keep up with continuously increasing knowledge and skills requirements. One single person cannot obtain, not to mention retain, even a fraction of all the knowledge currently available in our world. Instead, we need to learn how to efficiently connect separate pieces of knowledge – both within and outside of ourselves – and build knowledge relationships. These relationships should be built between people, but also between pockets of knowledge.

Part of learning to construct knowledge networks is understanding the varied sources of knowledge that are available to us, and how we need to use them differently to become modern Renaissance testers.

## Background

I have always had an insatiable hunger for knowledge, and to me one of the most wonderful things about our connected world is the unprecedented access to information it provides. I now have access to more information than I could ever have dreamt of, but what probably fascinates me the most is the many different sources of information there are, and how they are interconnected. I learn not only from books anymore, but from videos online, podcasts and even from Twitter. This made me start thinking about how my method for learning has morphed from being book-based to being multichannel, and how I no longer strive to keep all my knowledge in my head, but instead keep a map of where I can find it. I think of that as my personal knowledge network.

This idea kept floating around in my mind for quite a while, but the trigger that made me start paying more attention to it was Karen Johnson's keynote on solving problems at KWSQA in September 2016[1]. As is so often the case, information on a specific topic, gave me ideas and inspiration for a slightly different topic. In my head, I created a link between Karen's keynote and my thoughts on knowledge networks.

## Introduction

When I started school, there were really only two sources of information: books and

people, and the people category consisted of my teachers with guest appearances by my parents. It was a small, clearly defined information world that seemed very manageable. You got a textbook on a topic, you read every single word in it and you learnt the whole content of that book. That was the method for learning. And that does not work anymore.

In today's rapidly evolving technological society, changes are too frequent for us to be able to keep up with continuously increasing knowledge and skills requirements. One single person cannot obtain, not to mention retain, even a fraction of all the knowledge currently available in our world. Instead, we need to learn how to efficiently connect separate pieces of knowledge – both within and outside of ourselves – and build knowledge relationships. These relationships should be built between people, but also between pockets of knowledge.

We truly live in a connected world, and it is not only the machines we use that are connected. We also have an amazing collective knowledge-base, the power of which we must learn to harness by creating connections, both concrete and abstract. Knowledge simply does not exist in isolation anymore. We can increase our individual knowledge, and contribute to our collective knowledge, by better understanding how to forge knowledge connections. Rather than trying to learn and know everything ourselves, we can get access to the knowledge we need by creating relationships, and transferring knowledge out of the learned context to apply it in new situations.

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### Dimensions of a knowledge network

There are many different definitions of a knowledge network, but in the context of this article I interpret a knowledge network as a way to organize and map out our personal and professional knowledge. I believe there are four primary dimensions to a knowledge network:

- Purpose: Why do I need a specific piece of knowledge, and when do I need it?
- Depth: How deep is my knowledge currently in a particular area, and do I want to improve it?
- Breadth: Does my network include a variety of topics and types of sources?
- Connections: How many links are there between the nodes in my network, and how strong are they?

I will discuss these different dimensions one by one, but not necessarily in the order listed above. My focus will be on the importance of linking pieces of knowledge and knowledge sources to build a strong, efficient knowledge network.

## Definitions

To ensure a common understanding of certain terms and concepts that I will be using frequently, I would like to start by stating a few definitions. Keep in mind that these are my definitions, and there are other definitions that are equally, or even more, valid.

### *Knowledge, information and skills*

Are knowledge and information the same thing? Most dictionaries will use the two words as synonyms, whereas some people would vehemently argue that they are very different. For the sake of this particular discussion, I will define them as related, but different.

To me, information is pure data, and I would equate information with facts[2]. When I think of knowledge, I think of information that I have assimilated and understood. Knowledge is something I can use adaptively in different contexts. There can be no knowledge without information, but information does not imply knowledge. I think of information as the raw building blocks that can be turned into knowledge through processing. To me, knowledge is the theoretical understanding of something, skill is the actual ability to do something.

The reason I talk about knowledge networks, rather than information networks, is because of the connections between the items in the network. Two independent pieces of information turn into knowledge the moment you understand their joint meaning, and build a link between them.

## Knowledge

For better or worse, knowledge is not something that simply falls in our laps, but we actually have to work to obtain it. What is it that drives us to acquire new knowledge? I believe that one way to group our knowledge is to look at when we think we will need to apply the knowledge.

- Today: A need to immediately fill a knowledge gap that is preventing us from doing our work and executing tasks at hand.
- Tomorrow: A need to improve existing knowledge to be able to do our work better, and to be prepared for upcoming work.
- Future: A desire to acquire new knowledge for the simple pleasure of learning, without knowing whether or how that knowledge will eventually become useful.

Where we spend most of our learning time is highly dependent on our personalities, and the environments we are in, but I do think it is important to find a balance. The today learning is highly reactive, and can be very stressful for some individuals, whereas other people might need that pressure to be motivated to learn something new. Similarly, the future learning is proactive, and some people may find it tedious and meaningless.

We also have different depths, or levels, of knowledge. Acknowledging that all measurements are imperfect, I still like to

define five discreet levels to measure my own knowledge.

- Level 0: I know nothing.
- Level 1: I know where to find it.
- Level 2: I have a basic understanding of fundamentals.
- Level 3: I have a good understanding of fundamentals as well as a basic understanding of advanced concepts, but there are still gaps in my knowledge, and some knowledge is still shallow.
- Level 4: I have breadth and depth of knowledge.
- Level 5: There is nothing on this topic I do not know.

In case anyone was wondering, I have not reached Level 5 on any topic, and I do not expect that I ever will.

Using the knowledge levels, it is possible to create knowledge profiles. A generalist typically has some level of knowledge of numerous topics, whereas an expert, or specialist, has in-depth knowledge of one specific topic. Is it better to be a specialist or a generalist?

There seems to be a general trend towards increased specialization, where a successful career is being equated with focusing on one very narrow topic at the expense of all other topics. I was listening to an NPR podcast episode[3] that discussed inquiry and asking questions, and one quote that stuck in my mind was "expert is king". In today's society we revere the expert, and seem to believe that addressing complex problems requires a high degree of specialization. As it turns out, that could not be further from the truth. In his 2016 TIME article, Nick Lovegrove discusses the dangers of relying on experts and cites research that suggests that generalists are actually better problem solvers[4]. For those of us who consider ourselves generalists, that is hardly surprising. Having a broad knowledge base allows you to view a problem from a wider range of perspectives.

Even though I tend to favour generalists over specialists, I think the approach that has the best chance of making us successful today, and in the future, is t-shaped knowledge. I interpret t-shaped knowledge (or skills) as having both breadth and depth. It is a hybrid approach that combines the best of both worlds, allowing us to draw from a broad base of knowledge, while being able to reference specialist knowledge in a particular area.

## Cross-disciplinary knowledge

Having breadth of knowledge means having knowledge on a wide range of topics, but it is also important to have the ability to connect the separate pieces, and understand how they relate to each other. Transferring knowledge out of context and applying it in a new setting requires the ability to discern links and relationships. Therefore, I think cross-disciplinary knowledge plays a pivotal role in developing a knowledge network.

Cross-disciplinary knowledge allows us to explain aspects of one discipline in terms of another, e.g. "the chemistry of cooking".

*An example of the chemistry of cooking is baking bread using yeast. Yeasts are organisms that break down sugars into carbon dioxide and alcohol;[5] a process called fermentation. Carbon dioxide is a gas, and responsible for the dough rising. The alcohol evaporates as the bread bakes, and the gas bubbles formed during evaporation further helps the bread rise.*

Research has shown that learning that combines multiple disciplines improves the students' ability to:[6]

- Recognize bias
- Think critically
- Tolerate ambiguity
- Acknowledge and appreciate ethical concerns

Those abilities are always valuable, but especially in the context of testing. I believe it is essential for testers to have cross-disciplinary knowledge, and to embrace cross-disciplinary learning. Possessing cross-disciplinary knowledge can also make it easier to share knowledge, since you can use examples from a field you are both familiar with when describing a topic to someone.

In developing my ideas on knowledge networks, I explored, and borrowed concepts from, sociology, economics, physics, mathematics, ecology, business and education. Networks of different kinds are relevant in many fields of study, and understanding their relevance and meaning in separate disciplines helped me understand how they relate to my context.

## Knowledge networks

Knowledge has become one of our society's most treasured commodities. The industrial revolution brought factories fuelled by coal and dependent on manual labour, but we are living in the world of the information revolution[7] where businesses are fuelled by knowledge and relying on knowledge workers. In this age of information, knowledge networks are becoming increasingly important.

A knowledge network is a group of individuals sharing knowledge across organizational, geographical and disciplinary boundaries. Knowledge networks are not new, but how we construct and use them has changed with the advent of the internet and its related communication technologies. Bringing people together to share knowledge and collaborate can increase not only innovation and creativity, but also motivation.

Some may argue that a knowledge network is just a different term for a centre of excellence, or a community of practice, but I make a significant distinction between them. A centre of excellence is typically a resource that we interact with in a unidirectional manner. We either retrieve, or deposit, a piece of information, but we typically do not interact with the other users of the centre of excellence. In a knowledge network on the other hand, each individual can engage with, and learn from, everyone

else. Knowledge networks are multidirectional.

A knowledge network takes on a different character depending on how it is managed, and who benefits from it. The majority of the literature on the topic discusses "best practices networks" that are formal knowledge networks set up and managed by an organization to provide direct business value. I am more interested in exploring how we can strengthen our individual, self-managed, knowledge networks, including both personal and professional learning.

I picture our individual knowledge networks as consisting of nodes of topics and sources, connected in multiple ways. A strong knowledge network is created by striving for a balance of breadth and depth of knowledge, and engaging in cross-disciplinary learning. The more variety there is in terms of topics and types of sources, and the more connections there are between the nodes, the stronger the network is. We will not have the same level of knowledge on each and every topic, and we should not necessarily aim to increase our knowledge on every topic either. The key is to know where we can find that knowledge when we need it.

Again, I want to stress the distinction I make between information and knowledge. I think of information as data, and knowledge as information that I have understood and digested. If I was only interested in information, I would not need a network; I could use an encyclopedia instead to look up various facts. Identifying sources of knowledge takes more work. The

sources have to fit my way of learning and grasping new concepts.

The power of a knowledge network lies in the relative number of links. Identifying the relationships between topics and sources can be difficult, especially since we have often been taught subjects in isolation and from single sources (such as a teacher and a textbook), with little emphasis on connections to other subjects. I believe the key is to adopt a cross-disciplinary approach. When faced with a new problem or challenge in a specific field such as testing, we should look at the knowledge we already have in other fields, and how that knowledge could potentially transfer into this new context. Similarly, when we learn something new, we should try to think about how it may apply to other contexts. It is easy to get lost in details, but if we do not make sure to discern the bigger picture, it is almost impossible to identify the connections between topics.

### *Vulnerabilities of knowledge networks*

Knowledge networks, like any type of network, have vulnerabilities, and it is important to be aware of them.

#### Outages

Your personal network will contain sources you do not have control over, which means that the piece of information you are looking for might not be available when you need it. There may be delays and even outages, where specific sources are completely unavailable. A fairly recent example is the DDoS (distributed denial of service) attack

in October 2016[8] that brought down popular websites such as Amazon and Twitter.

It is not only web-based parts of your network that can suffer outages, though. Your friend that knows everything you need to know about plumbing might go on vacation, hiking in the Grand Tetons, and have no cell coverage for two weeks.

### Viruses

Malicious code can spread in computer networks, and we refer to that as a "virus", but can a virus really infect knowledge networks? Maybe. Just like malicious code can spread throughout a computer network and cause damage, misinformation like fake news can spread through your knowledge network.

In a world with a seemingly endless supply of information, skepticism and critical thinking become even more important. I would argue that critical thinking is our equivalent of an anti-virus program, and we should never, ever turn it off.

## Summary and conclusions

We live in an era where the demand for knowledge is continuously increasing, and being a knowledge worker can be both exhilarating and challenging. Traditional approaches to learning are often revealed to be inadequate, and being able to adapt new strategies to harness knowledge will be essential for success. I believe the key is to build a strong and efficient knowledge network by:

- Determining knowledge objectives
- Understanding how to apply existing knowledge in novel contexts
- Embracing cross-disciplinary learning and knowledge

It may seem a daunting task, but I believe that is how we can become modern Renaissance testers.

## Acknowledgement

My ideas and thoughts do not evolve in isolation; they are the product of reading, listening and discussing. I am constantly reading articles, blogs, books and magazines. I listen to the radio, podcasts and people. I discuss my ideas with anyone who is willing to take the time to give me feedback and input. In writing my thoughts on knowledge networks, I am especially grateful for the insights provided by Sherry Heinze. Thank you.

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[1] Karen Johnson, KWSQA 2016,
http://kwsqa.org/conference/keynotes/

[2] It may be counterintuitive, but while I equate information with facts, I do not assume all information to be true, or correct.

[3] TED Radio Hour, The Spirit Of Inquiry, February 24, 2017,
http://www.npr.org/podcasts/510298/ted-radio-hour

[4] TIME, October 27, 2016,
http://time.com/4547320/the-danger-of-having-too-many-experts/

[5] There are additional products created, such as flavour molecules and energy.

[6] Why Teach with an Interdisciplinary Approach?,
https://serc.carleton.edu/econ/interdisciplinary/why.html, retrieved on March 11, 2017.

[7] Wikipedia, retrieved March 2017,
https://en.wikipedia.org/wiki/Information_revolution

[8] https://phys.org/news/2016-10-twitter-spotify-websites-ddos.html