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## Stakeholder Perceptions of Success Within a STEM Ecosystem

Heather L. Daubert

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STAKEHOLDER PERCEPTIONS OF SUCCESS WITHIN A STEM ECOSYSTEM

By

Heather L. Daubert

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Supervisory Committee:

Tamara Williams, Ed.D., Chair

C. Elliott Ostler, Ed.D.

Kay A Keiser, Ed.D.

Dana Richter-Egger, Ph.D.

## **Abstract**

### **STAKEHOLDER PERCEPTIONS OF SUCCESS WITHIN A STEM ECOSYSTEM**

Heather L. Daubert, Ed.D.

University of Nebraska, 2021

Advisor: Tamara Williams, Ed.D.

The Omaha STEM Ecosystem (OSE) is a multi-stakeholder collaborative network (MSCN) with active members from six key stakeholder groups (Business, Education, Family, Government, Non-Profit, and Science Centers and Museums). OSE serves as a connecting agency which leverages the social capital of these member stakeholders to address the STEM workforce gap by strengthening the availability of STEM pipeline learning opportunities. The purpose of this qualitative study was to synthesize the shared and nuanced definition of success for all key stakeholder groups in OSE with the STEM lexicon. This dissertation presents the findings of semi-structured interviews with a theory of success built from a shared lexicon, gleaned from both organizational documents and interviews. The collective voice of all stakeholder groups concludes that through Networking, Collaboration, Diverse Opportunities, and Community Awareness, OSE will foster success by bringing people to the organization, holding them active, growing the participation, and producing varied opportunities which support the STEM pipeline.

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PREVIEW

## Acknowledgements

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## **Dedication**

For the ones who raised me to believe I could do anything.

Mom and Dad, this is for you.

PREVIEW

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PREVIEW

## Chapter 1: Introduction

Multi-stakeholder Collaborative Networks (MSCN) seek to solve complex problems through the sharing of resources toward a common goal (Traphagen & Saskia, 2014). MSCNs consist of many stakeholder groups and individual stakeholders. Although the collective focus of a common goal is shared by all, each stakeholder likely has their own sub goal particular to their context (Rolof, 2008, p. 235). It is important for all members of the MSCN to know and understand the shared common goal as well the unique and varied subgoals of different MSCN members.

The Omaha STEM Ecosystem seeks to bring diverse stakeholders from multiple sectors of the community together to promote high-quality STEM learning opportunities that will address the current and future workforce gap associated with STEM skill sets (Omaha STEM Ecosystem and Parlay Consulting Firm Inc., n.d). There are six key stakeholder groups in the Omaha STEM Ecosystem (OSE). Key stakeholders include government, science centers & museums, education, non-profits, business, and families. All OSE members share the common mission of building a stronger STEM community by connecting education and business development for tomorrow's workforce (Omaha STEM Ecosystem and Parlay Consulting Firm Inc., n.d). Additionally, stakeholders within the Omaha STEM Ecosystem hold individual sub goals specific to their particular role. Families seek engaging opportunities to develop future skills, businesses to provide for a workforce, nonprofits to assess participation count and growth, education to measure assessed skill development, science centers and museums to engage with visitors, and government institutions to promote economic growth. By

focusing their resources and sharing their own expertise and experience, each stakeholder contributes an important part to the STEM Education pipeline.

Establishing a consensus of success criteria allows collaborative stakeholder groups to maintain the value of their individual role in the collaboration with other stakeholders while recognizing the relationship of the network's broader goal which their focus supports. Edward Freeman, in his work on stakeholder theory, referred to this as joint value creation (Freeman, 1994, p. 415). MSCNs functioning in this way are more equipped to bear the resources necessary by operating as a collaborative group rather than silos of isolated opportunity and outcome.

The Omaha STEM Ecosystem seeks to develop from its established foundation and accelerate its continued growth. Like other non-profit collaboratives, it benefits from an outside perspective of current impact and analysis of opportunities of growth.

### **Purpose Statement**

Therefore, the purpose of this qualitative study will be to synthesize the shared and nuanced definition of success for all key stakeholder groups in OSE with the STEM lexicon.

### **Central Research Questions**

1. How do the Omaha STEM Ecosystem's key stakeholder groups define success of the local STEM ecosystem?
2. What is the STEM lexicon within the Omaha STEM ecosystem?

### **Significance of the Study**

This formal evaluation seeks to lay the foundation for a future impact assessment of the Omaha STEM Ecosystem. The subsequently presented framework establishes,

firstly, a common STEM Lexicon and secondly, be used to articulate a shared vision for success. Both, in turn, provide the necessary elements for the organization to perform their collective impact assessment.

### **Operational Definitions**

- **Omaha STEM Ecosystem - Multi-Stakeholder Collaborative Network (MSCN)** - A local extension of the National STEM ecosystem, comprised of multi-sector collaboratives with the shared mission of building a stronger STEM community by connecting education and business development for tomorrow's workforce (Omaha STEM Ecosystem and Parlay Consulting Firm Inc., n.d.).
- **Key Stakeholder Groups** - As an organization, the Omaha STEM Ecosystem identifies the six key stakeholder groups as government, science centers & museums, education, non-profits, business, and families (defined through alignment with the Omaha STEM Ecosystem's interpretation of these sectors).
- **Local Lexicon of Omaha STEM Ecosystem** - The agreed meaning of terms held by individuals of a specific organization or group. Local Lexicon allows members to apply the same meaning to terms which may hold a broader meaning within general use, but has a specific understanding within the context of their collaboration.
- **Success** - Established criteria that aligns the values and actions of the organization across its stakeholder groups and is used to measure its fidelity in enacting those values.

### **Limitations**

The scope of this study's findings is limited in application to the Omaha STEM Ecosystem. Participants in the research are members of the key stakeholder groups as defined by the Executive Committee. Stakeholders largely consist of committee members who share vested interest in the success of the Omaha STEM Ecosystem.

Initial document analysis occurred using artifacts supplied by the organization's leadership seeking evaluation. These may represent a limited perspective of the broader stakeholder experience within the Omaha STEM Ecosystem.

Interviews were conducted via phone or video conference as a matter of convenience and public health due to the limitations of the COVID-19 pandemic on meeting in person. There is some consideration that in-person responses could differ from those received through this format.

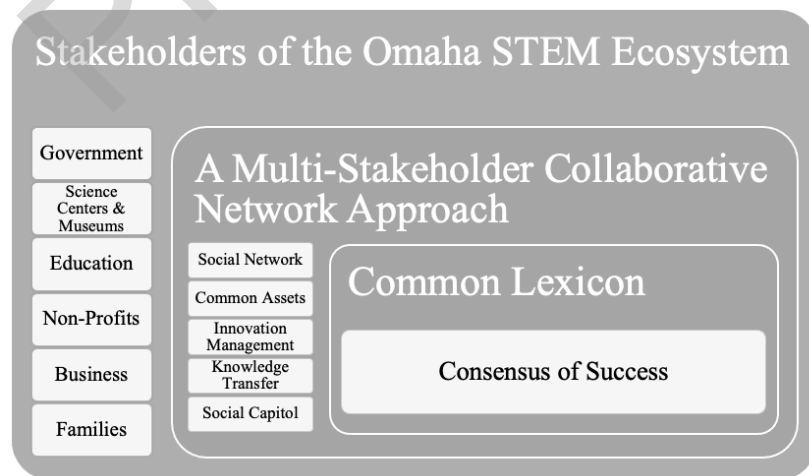
## Chapter 2: Perceptual Framework

### Framework

The scope of this research has been to ensure a common STEM lexicon exists within the organization and to establish a shared definition of success for the stakeholders of the Omaha STEM Ecosystem.

In prior work with the Omaha STEM Ecosystem., Dr. Tracie Evans Reding established the complexities of resource awareness within this multi-stakeholder collaborative network. Through a perceptual framework, Dr. Reding showed that social network, common assets, innovation management, knowledge transfer, and social capital are critical cogs of the MSCN's functionality, and the shared norms and the roles of the innovators and bridgers within the organization are significant components (Reding, 2018, p. 74-77).

This research is not intended to shape or form the Omaha STEM Ecosystem's values. Instead, the intent of this research is to build upon Dr. Reding's work and ensure all sectors of stakeholders are saying and valuing the same things.



**Figure 1**

*Perceptual Framework of Study*



The absence of an agreed-upon common lexicon makes it difficult to ensure each stakeholder has the same vision of success. In order for the group to truly define success, they must have a common understanding of the organization's goals to align their own efforts to those outcomes. The language needs to reflect the lexicon of the organization and not of its individual members.

Consensus building serves as the underlying foundation of establishing common success criteria in an MSCN. All stakeholders need to be committed to their role in the broader goal to maintain the collaborative unsilo-ed approach to accomplishing the group's goal. Within an MSCN "accomplishing anything significant or innovative requires creating flexible linkages among many players" (Innes & Booher, 1999, p. 412).

## Chapter 3: Methodology

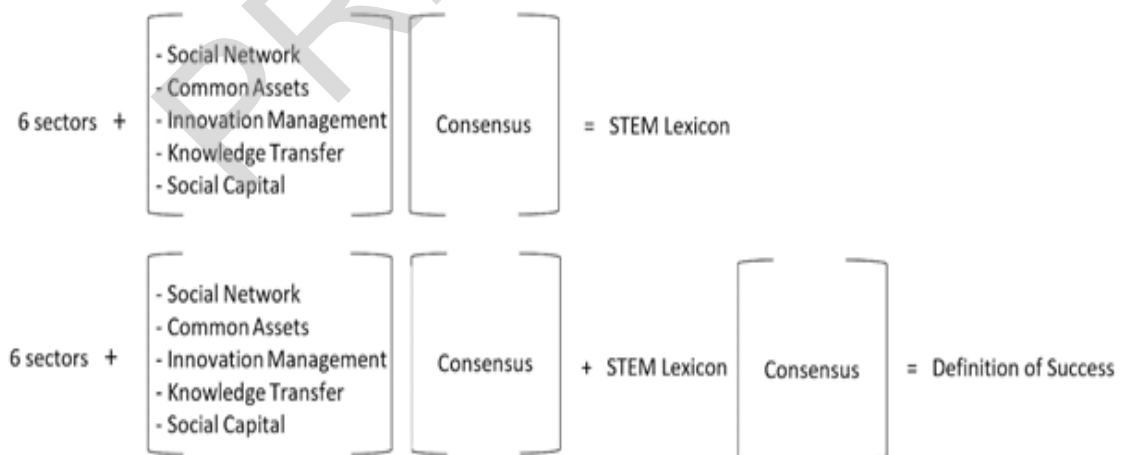
### Central Research Questions

1. How do the Omaha STEM Ecosystem's key stakeholders define success within the local STEM ecosystem?
2. What is the STEM lexicon within the Omaha STEM ecosystem?

The results of the research reveal two key organizational tools: a shared vocabulary (STEM lexicon) across the stakeholders and a mapping of interconnected coding themes that both suggest opportunities for shared success and stakeholder pairings that are ready to pursue those efforts. This offers the organization a concrete path to pursue their strategic goals.

### Design of the Study

The design of this research is similar in approach to grounded theory, but the result will be that the Omaha STEM Ecosystem will have a common STEM lexicon and a shared definition of success.



**Figure 2**

*Design of Study Elements*

As represented in Figure 2, when a multi-stakeholder collaborative network (MSCN) comes together and leverages their common assets and relationships for a common goal, they should filter that through an established lexicon. When the stakeholders operate without an agreed-upon common vocabulary, by default, each member will apply his own definitions from his own experiences and biases. This makes it difficult to ensure each group's actions align with the overarching goal of the MSCN. Establishing an agreed-upon STEM lexicon to be used within the MSCN is essential if the group is to achieve its mission.

When a common lexicon is in-place and widely used throughout the organization's subgroups and sectors, the MSCN is able to meet its mission and goals. Consensus allows the Omaha STEM Ecosystem, to establish a universal definition of success for the local organization. With this definition in place, the Omaha STEM Ecosystem will be better positioned to measure its effectiveness.

### **Participants**

Participants of this study consisted of individuals identified by OSE as key stakeholders within the OSE Ecosystem. These are representative interviews with individuals participating on a voluntary basis. Participants' identity was kept internal to the organization and findings have been reported at the stakeholder group level. Researchers aimed to make the number of participant interviews equitable across the stakeholder groups.

### **Participant Data (or Data Collection)**

As data was provided by the organization and was treated as non-identifiable aggregate records, there is minimal risk to vulnerable individuals or populations. Results

used to develop semi-structured interviews will add to the library of resources used for continuous comparison and allow for ongoing revision of coding until further relationships do not emerge.

The first stage of data collection was the gathering of key stakeholder documents. Documents were analyzed for frequency of common words and phrases to establish an initial coding scheme. Codes were evaluated for a second pattern coding step. Finally, codes were analyzed for relationships within the data in order to draw conclusions from the analysis.

Stage two of data gathering involved semi-structured interviews with members of the key stakeholder groups. Interview participants were recommended by the Executive Committee of the Omaha STEM Ecosystem and contacted by the researcher through a formal invitation sent by email. Interviews were administered through video conference, recorded, and transcribed through the use of video captioning software. Text transcripts were analyzed within a qualitative coding platform. Transcripts are only identifiable as participants representative of their key stakeholder group.

Equitable representation of stakeholder groups is an important factor to ensure that interview results are representative of the broader organization. The researcher included a minimum of four participant interviews within each stakeholder group. Interview participants were invited from a rolling list of possible interviewees. If a requested participant was unavailable to participate, the next participant was invited. When more than four interviews of one stakeholder group occurred, the researcher reported findings as a percentage of that stakeholder group's responses.

## **Data Analysis**

The data for this evaluation was collected in two stages. The first stage is a document review of public-facing and internal OSE documents including committee meeting notes, meeting transcripts, and meeting minutes. The second stage of data collection was conducted through semi-structured interviews with members of all key stakeholder groups.

**Table 1**

*Document Analysis and Semi-Structured Interviews*

Foci	Data Collection	Analysis Process	Final Result
STEM Lexicon	Document analysis of internal and public facing OSE documents	Coding documents for common themes	STEM Lexicon established
Definition of Success	Document analysis of internal and public facing OSE documents	Coding documents for common themes	Partial definition of success started
Definition of Success: Consensus Confirmation	Semi-structured interviews of members from key stakeholder groups	Compile responses from interviews Constant comparison method	Shared definition of success established

An initial frequency analysis across documents provided a starting point for the development of a constant comparison coding approach. Documents were read and excerpts identified that demonstrate these codes. During the pattern coding stage, codes were re-evaluated to determine if individual codes carry common meaning. Documents were re-read to verify that codes still match with the excerpts identified. Finally, codes were analyzed for relationships within and across documents. Established linkages across the sectors identified where consensus of goals and success criteria existed, as

articulated formally and observed through their preponderance within the organization's documents

The use of a constant comparative coding approach to analysis of the data provided a structured mechanism to recognize patterns as they emerged. Constant comparative coding is typically operationalized as open coding, axial coding, and selective coding, from which conclusions can be drawn with minimized bias (Corbin & Strauss, 2014). Later, the substitution of pattern coding for axial coding was selected as a better fit during second stage coding (Saldana, 2021, p. 322). Initial quantitative analysis of key terms and phrases established a coding scheme not influenced by the researcher's individual perspective. Subsequent excerpting and memoing more broadly identified the deeper meaning of the common STEM lexicon being used by the ecosystem.

Documents analyzed were those obtained from Omaha STEM Ecosystem. Semi-structured interviews adhered to a planned script of questions designed not to influence the response received. Analysis of interview transcripts occurred after the interview with the same coding scheme applied from the document analysis.

For this study, the researcher analyzed the shared definition of success and establishment of a shared lexicon. By looking at the dialogue within the stakeholder groups and between the stakeholder groups, this researcher identified and validated a common lexicon within the organization. By establishing this shared vocabulary and a clear, common shared vision of success, the continued, collective work of the Omaha STEM Ecosystem has the potential to be accelerated.

## **Measurement**

“Theory, empirical research, and practice all reveal that because cross-sector collaborations are so complex and dynamic and operate in such diverse contexts, it is unlikely that research-based recipes can be produced” (Bryson et al., 2021, p. 658). Because of the diversity of its members and the varied involvement of each, when trying to measure the effectiveness of an ecosystem, simply tracking the individuals and activities, let alone the cumulative impacts from the variety of experiences and settings is difficult (Allen & Pederman 2019; Morrison and Fisher, 2018; van Tulder et al, 2016). Further, while anticipated success is often discussed in multi-sector collaborations, it is not often measured because it is so broad that no one method or process works. Part of this comes from the desire to “jump in and get involved” and not worry so much about measuring a person’s actions (van Tulder et al., 2016, p. 4). The challenge, then, is to understand all of the details of the collaborative well enough to produce good results with limited failure (Bryson et al., 2021, p. 657).

Allen, Lewis-Warner, and Noam (2020) suggest that when an ecosystem does collect data, it should be intentional, transparent, and evidence-based. It should also involve multiple sources and the results should be applied quickly and effectively (p. 39). When an ecosystem does collect data regarding the effectiveness of an activity or event, possibly through a survey or feedback from a focus group, they may consider looking at the activities provided, the participants, the student outcomes, and program quality outcomes (Allen, Lewis-Warner, et al, 2020, p. 36). These results should be shared across the collaborative partnership. This includes not just sharing what is working, but also where challenges may exist so initiatives can be adjusted as needed (Asera, 2017). However, Allen, Lewis-Warner, et al (2020) suggests stakeholders look beyond

the total number of people attending, and instead use the surveys to ask the participants about their interests and attitudes to help build better student-based opportunities.

While there is a desire among some members of STEM ecosystems in various states to have a common data warehouse and assessment protocols, such processes do not yet exist. In the absence of this, van Tulder et al. (2016) suggests that members ask “Does the partnership provide additional ways of achieving the societal ambitions that would not have otherwise been possible?” (p. 11).

### **Role of Researcher**

The outsider context of a researcher presents both an objective view and an unfamiliarity with the history, process, and experiences of the stakeholders. Within qualitative research, the bias of the researcher’s interpretation is one consideration when interpreting the findings. In this study, the role of the researcher is to gain familiarity with the work of the Omaha STEM Ecosystem while maintaining an external lens to the analysis of documents and semi-structured interviews.

### ***Researcher Daubert:***

As a researcher, I am a 49-year-old female doctoral scholar at the University of Nebraska in Omaha. For twenty-seven years, I have been an educator in one large, Omaha-area suburban school district. During my career I spent twelve years as a middle school English teacher, four years as a district curriculum and instruction facilitator for math, industrial technology, and computer science, and eleven years as a middle school assistant principal.

I have no personal experience with the Omaha STEM Ecosystem or the key stakeholders, although my sister is a renewable energy practice lead for an engineering



firm headquartered in Omaha. In addition, my current middle school does have science classrooms which have benefitted from grants offered by OSE's founders. My personal knowledge of STEM-related activities in the Omaha community is limited to what is promoted through advertisement.

Professionally, when I was a district curriculum facilitator in my school district, I worked directly with math, computer science, and industrial technology (now known as Skilled and Technical Sciences) teachers and departments. During that time, I also consulted with local businesses, Metropolitan Community College, the University of Nebraska's Charles W. Durham School of Architectural Engineering and Construction, and the Nebraska Department of Education Skilled and Technical Sciences (STS) division to ensure the district's STS curriculum prepared our high school graduates for post-high school level opportunities in the STS career field. I worked similarly with the district computer science department, although those consultations were narrowed to professors from Creighton University and the University of Nebraska at Omaha's Peter Kiewit Institute. Currently, as a middle level administrator, my involvement with STEM education is limited to supporting educators and district initiatives.

In preparation for completing this research I have joined the Omaha STEM Ecosystems contact list in order to receive communication and advertising on current practices within the organization.

***Researcher Higginbotham:***

As a researcher my individual background is as a 38-year-old male doctoral scholar at the University of Nebraska at Omaha. My professional career as an educator has spanned seventeen years within the elementary (kindergarten through sixth grade)