A Dynamic Systems Approach to Internationalization of Higher Education

Jiangyuan Zhou
Stockton University

Research shows that internationalization of higher education is a process rather than an end product. This paper applies the Dynamic Systems Theory to examine the nature and development of internationalization of higher education, and proposes that internationalization of higher education is a dynamic system. A dynamic framework of internationalization of higher education is therefore proposed. Internationalization of higher education has five levels – Global, National, Institutional, Program, and Personal Levels, and each level has five components – Purposes, Outcomes, Programs, Approaches, and Projects. Each level has a Developmental Range depending on the dynamic relationships between factors at this level. The Initial State, Attractor State, and Control Parameters are other key factors in examining internationalization of higher education at individual levels. A 'snapshot' and a wheel of internationalization of Stockton University are further discussed as examples of applying a dynamic systems approach to internationalization of higher education. This dynamic framework of internationalization provides theoretical and practical implications for defining, developing, and strengthening internationalization of higher education.
Keywords: Internationalization; Dynamic Systems Theory; Higher education; Higher Education Administration; Wheel of internationalization; Snapshot of internationalization

With the needs of the 21st century, growth of student mobility, and advancements of technology, internationalization has moved 'from the fringe of institutional interests to the very core' (Brandenburg & De Wit 2010, p.15) of higher education. Based on various theories and research, several models have been proposed to develop internationalization of higher education (Altbach & Knight 2007; Altbach et al. 2009; Brennan & Garvey 2009; Chao 2014; De Wit 1995, 2000, 2002; Dewey & Duff 2009; Henard et al. 2012; Hudzik & McCarthy 2012; Knight 1997, 2004; Knight & De Wit 1995; Leask 2009, 2012, 2013a, 2013b; Sanderson 2008; Van der Wende 1997, 2001, 2010; Zha 2003).

However, current practices of internationalization of higher education often prompt two questions – How to define and develop internationalization at individual institutions? and How to coalesce isolated and scattered pieces of internationalization on campus? Therefore, a new theory-based framework of internationalization focusing on these two concerns would be a good contribution to the nature and practices of internationalization of higher education.

Definitions of Internationalization of Higher Education

Internationalization of higher education is constructed and represented differently at different times and in different cultural contexts (Knight 2004; Leask 2012); therefore, the definition of internationalization has been evolved in the past years. Knight (2004) defined internationalization as 'the process of integrating an international, intercultural or global dimension into the purpose, functions or delivery of post-secondary education' (p. 11). She emphasized that internationalization has national/sector and institutional levels. The national/sector forces have a top-down effect on the internationalization at institutions, but the real process of

internationalization happens at the institutional level. Rumbley (2013, 2014) also analysed internationalization of higher education happened in a national community and in individual institutions as well.

Altbach and Knight (2007) and Altbach et al. (2009) emphasized that internationalization should include the policies and programs undertaken by academic systems, institutions, and government – and even individuals – to respond to the global academic environment. Hudzik (2011) defined comprehensive internationalization as 'a commitment, confirmed through action, to infuse international and comparative perspectives throughout the teaching, research, and service missions of higher education' (p.7). NAFSA (2011) recognized internationalization as an essential component of higher education and proposed the working definition of internationalization as 'the conscious effort to integrate and infuse international, intercultural, and global dimensions into the ethos and outcomes of postsecondary education. To be fully successful, it must involve active and responsible engagement of the academic community in global networks and partnerships' (p. 1).

These definitions of internationalization of higher education shared the same idea that internationalization is a process rather than an end product (Zha 2003). Internationalization shapes the missions and goals of institutions and hence changes every aspect of higher education, and thus it has a variety of variables that interacting with each other, which makes internationalization a complex system (de Bot et al. 2007). But few previous studies examined internationalization of higher education with a focus on these dynamic features (Knight, 2004; Tange & Jensen, 2012). Therefore, this paper applies the Dynamic Systems Theory to re-consider the nature and development of internationalization of higher education and to provide solutions to the constant concerns of defining, developing, and strengthening internationalization.

The Dynamic Systems Theory: Its principles

Based on the advances in mathematics, psychology, biology, and physics, Dynamic Systems Theory (DST) proposes an approach to examine the dynamics of complex systems (de Bot et al. 2007; Thelen & Smith 1994, 2006; Spencer et al. 2012). DST has been successfully applied to various topics in different disciplines, including cognition, consciousness, skills, learning, and language acquisition (Bielecki et al. 2000; de Bot et al. 2007; Fischer & Bidell 2006; Spencer et al. 2012; Thelen & Smith 1994, 2006; van Geert & Steenbeek 2005).

DST defines dynamic systems as the 'systems of elements that change over time' (Thelen & Smith 2006, p. 258). That is, a dynamic system is constantly developing rather than fixed and static. By interacting with the environment frequently, the system keeps reorganizing itself internally and hence re-constructing the whole system continually across time and contexts.

DST proposes that one dynamic system is composed of many sub-systems, with the same dynamic principles operating at each level. These sub-systems, including all variables of the sub-systems are completely interconnected. The variables continually interact with each other and by doing so, changes in one variable or sub-system will have an impact on the whole system through the self-organizing process. Therefore, a dynamic system is constructed not on a simple cause-and-effect model, but on the complex interactions between variables. Multiple causes might lead to different effects in various contexts, and 'no single component – internal and external – has the causal priority' (Thelen & Smith 2006, p. 281). Every variable, no matter big or small or on which level, is inseparable to this nonlinear dynamic system.

DST emphasizes two important states of dynamic systems. The first one is the Initial State. A dynamic system is constructed based on its own history, and the variations of the system at this initial starting point make it 'sensitive to specific input at specific time' (de Bot et al. 2007, p. 8), and lead to different developments. The other state is the Attractor State. A dynamic system is open and continually self-organizing, thus it is highly unpredictable. But under certain conditions, the system may display a stable status in the constantly-changing process. This temporary stability is an Attractor State, which represents that the components of the system are

coordinating coherently, and thus the system has reached 'an affinity for that state' (Thelen & Smith 2006, p. 272). Then the whole system is developing steadily and smoothly. With external forces, the system might change from its current Attractor State, but if the perturbation of the system is not strong enough to permanently remove the affiliation of the state, the system tends to return to the current Attractor State when the external energy disappears, but if the perturbation is strong enough, the system will move on until it reaches another Attractor State. The Attractor States of internationalization are interdependent and are always built on previous ones.

DST further proposes the parameters of a dynamic system, which means the factors that push the system move forward or stop it from developing. The Control Parameter refers to 'a parameter to which the collective behaviour of the system is sensitive and that thus moves the system through collective states' (Thelen & Smith 2006, p. 275). This Control Parameter is critical to the system because a small change of it will lead to a status change – may be beneficial or detrimental – in the system. It is system-specific, thus a thorough understanding the system, including its components, statuses, and contexts, is necessary in identifying the Control Parameter of this system.

Overall, DST contributes to understanding dynamic systems with the following major principles:

- Dynamic systems are open, self-organizing, and continually changing.
- Dynamic systems are multi-levelled, interconnected, and complicated.
- Dynamic systems are independent with their own factors, including components,

specific Initial State, Attractor State, Control Parameters, and context.

Therefore, DST provides concepts and tools to examine dynamic systems in all their complexity, richness, diversity, and development.

In the next section of the paper, the principles of DST will be applied to examine internationalization of higher education.

Internationalization of Higher Education: A Dynamic System

Based on the definitions and literature of internationalization (Altbach et al. 2009; Bartell 2003; De Wit & Hunter 2014; Hudzik 2011; Knight 2004; Leask 2012; Schoorinan 1999; Van der Wende 2001; Wright 2009) and the principles of DST (Thelen & Smith 1994, 2006), this paper proposes that internationalization of higher education is actually a dynamic system, and put forward a new dynamic framework of internationalization of higher education (see Figure 1).

In this model, internationalization of higher education happens at five levels. *Global Level* is the broadest level, which refers to the internationalization happens in the global context, such as the essential skills for all the students in the 21st century, global economic development, or technology adopted across countries. The second level is the *National Level*, which reflects the unique situation and needs of internationalization in one specific country. It involves topics like national student mobility trends or intercultural communication between countries. The third level is the *Institutional Level*, which refers to the internationalization at individual institutions, with topics like institutional missions of internationalization or various international programs on campus.
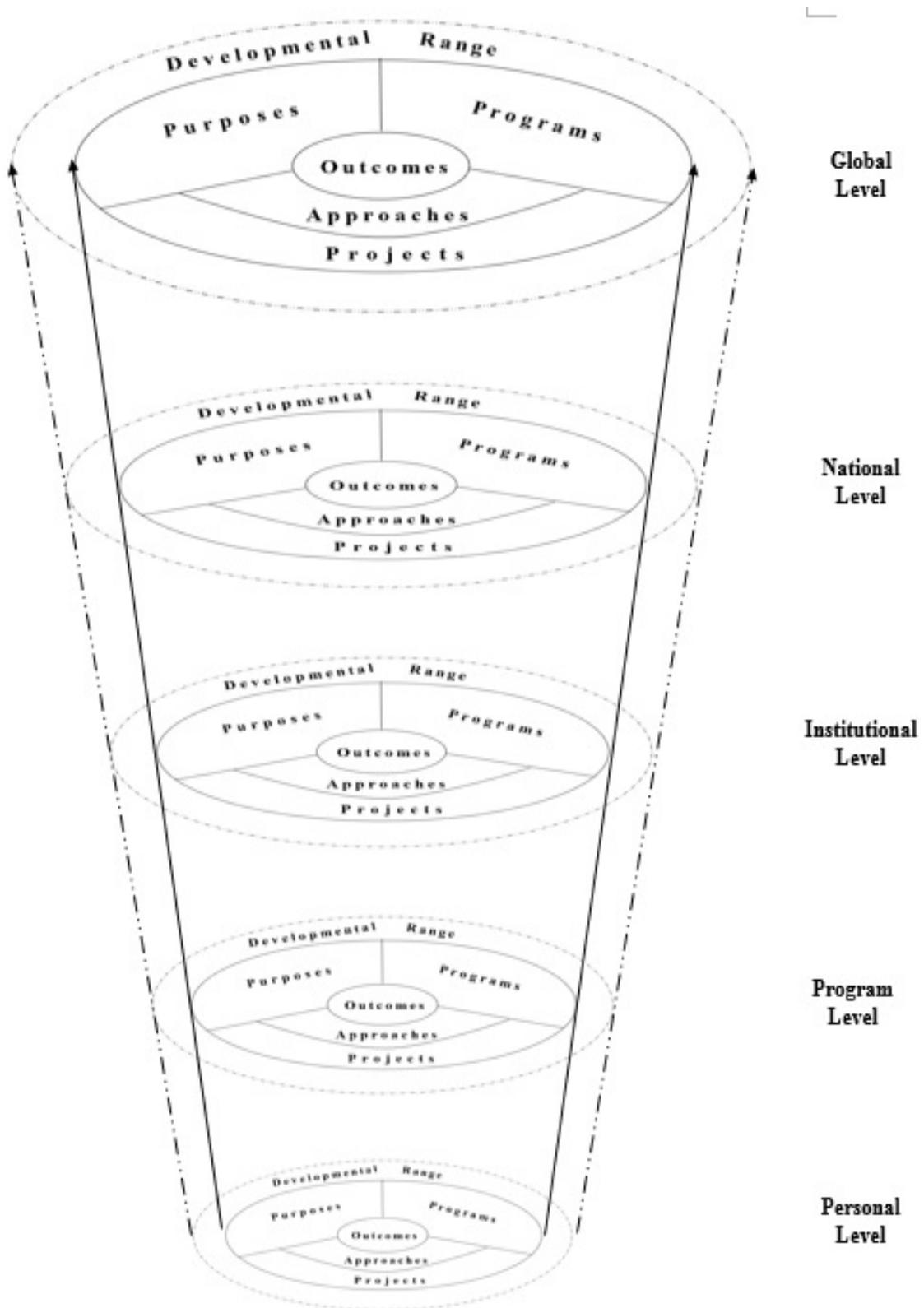
Figure 1. A dynamic framework of internationalization of higher education.

Internationalization at the Institutional Level is also closely related to the regional/local contexts such as cultural demographics and economic developments in the community. The fourth level is the *Program Level*, which involves specific definitions or requirements of internationalization in various disciplines, such as internationalization in economics or in education. The fifth level – the narrowest level – is the *Personal Level*. It refers to individual activities and skills of internationalization, such as faculty members' courses and instructions, students' curricular and extracurricular activities, or staff members' professional development on internationalization issues.

At each level, internationalization has five components – Purposes, Programs, Approaches, Projects, and Outcomes. These components are the answers to four key questions of internationalization. *Purposes* answer the first question – Why does the subject want internationalization? Purposes are the subject's overall goals and objectives of internationalization, such as the mission or strategic plan of a country or an individual institution. *Programs* are the answers to the second question – Where does the subject need internationalization? Programs refer to the areas where internationalization actually happens. These areas need or require involvements and developments of internationalization to achieve their new or existing functions or objectives. Approaches and Projects answer the third question – How does the subject achieve internationalization? *Approaches* are the methods to achieve the Purposes of internationalization in various Programs. They describe and assess the manners in which internationalization is being conceptualized and implemented. Approaches are summarized from and composed by numerous Projects of internationalization. *Projects* – the specific activities of internationalization – are the smallest unit of internationalization and the most diverse and dynamic one as well. *Outcomes* are the answers to the fourth question – What does the subject get from internationalization? Outcomes are the final products of internationalization. American Council on Education proposed that internationalization leads to global learning, and further defined global learning as 'the knowledge, skills, and

attitudes that students acquire through a variety of experiences that enable them to understand world cultures and events; analyse global systems; appreciate cultural differences; and apply this knowledge and appreciation to their lives as citizens and workers' (Olson et al. 2006, p. v).

When moving from lower levels to upper levels, internationalization has broader Purposes, develops larger domains of Outcomes, happens in more diverse Programs, and requires more various Approaches and Projects. Therefore, the dynamic framework of internationalization of higher education is upside-down cone-shaped.

All these levels and the components at each level of internationalization are interconnected. A small change in one component at one level might change the current state at this level or even has impacts on internationalization at other levels or the whole internationalization system. By interacting among all these components, levels, and environment, internationalization of higher education is constantly adapting itself, thus it is constructed as one dynamic system.

Even though each level is a sub-system of internationalization and operates with the same dynamic principles, it is also an independent self-organizing system. Each level has its own components, Initial State, Attractor State, Control Parameters, history, context, and so on. Therefore, all these factors should be examined in analysing internationalization at individual levels.

Another important feature of this dynamic framework of internationalization of higher education is the *Developmental Range* of internationalization at each level (Fischer & Bidell 2006; Fischer & Yan 2002). This Developmental Range is determined by re-constructing relationships between factors at each level, including the components, Initial State, Attractor State, parameters, people, contexts, and so on. Among all these factors, the *Control Parameter* reflects 'the collective behaviour of the system' (Thelen & Smith 2006, p. 275) and thus becomes the determinant of the Developmental Range of internationalization at each level. When the value of the Control Parameter increases, internationalization will lose its stability and increase the variability, and thus expand to its Developmental Range. This 'new and different coordinative mode' (Thelen & Smith 2006, p.275) may disappear quickly or stay

for a while depending on the changes of the Control Parameter, and if the Control Parameter reaches a critical value, internationalization at this level will move on and settle into a new Attractor State (Fischer & Bidell 2006).

Since internationalization at the Institutional Level has gained the most attention and been studied the most extensively (Rumbley 2010; Schoorinan 1999), the last section of this paper will introduce an example of applying this dynamic framework to examine internationalization of a higher education institution, and hence to provide solutions to define, develop, and coalesce internationalization at this institution.

A Dynamic Systems Approach to Internationalization of Stockton University

Stockton University is a public four-year higher education institution in southern New Jersey, USA. It has 9,000 students in eight academic schools with 88 undergraduate and graduate programs (Stockton: About, n.d.).

Initial State and Attractor State of Internationalization of Stockton University

DST examines dynamic systems from a developmental perspective. Therefore, understanding the history of internationalization of Stockton University is critical in conceptualizing and developing its internationalization (Spitzer & Zhou 2014). Stockton established an International Business program in 1990s and received several awards and grants of international business courses and activities afterwards. After a quiet period of internationalization, Stockton has initiated a campus-wide strategic planning of internationalization since 2008. In 2008, with close collaborations of the Stockton community, Stockton included globalization in its vision statement – 'Stockton University as an environmentally-responsible learning community of engaged citizens embracing a global perspective' (Stockton: About, n.d.). In 2010, Stockton participated in The American Council on Education (ACE) Internationalization Laboratory. Based on the ACE Assessment of Stockton's internationalization efforts (Stockton

ACE Review 2010), Stockton established the Office of Global Engagement, which focuses on the linkages with international universities and education abroad Programs. In 2011, Stockton established Global Perspectives as one of the four themes of its Strategic Plan Initiatives. A Global Perspectives Initiatives Team was created and further divided into four subcommittees – ESL/Languages; Community Resources; International Students; and Funding/Partnerships – to encourage and fund proposals related to global perspectives. In 2011, Stockton identified Global Awareness as one of its ten essential learning outcomes (ELOs) and established a committee on infusing Global Awareness ELO throughout the curriculum at Stockton. In the same year, Stockton established a Global Studies Minor. In 2012, international/global education was identified as critical to the ongoing development, growth and success of the institution (Stockton ACE Report 2012). In 2013, Stockton hired an Internationalization Specialist to focus on internationalizing the curriculum. Specific approaches to internationalization were developed and adopted. Building on these work and efforts, numerous projects related to various aspects of internationalization have been implemented and proposed on campus.

So far, the key components of internationalization have been identified and shared by the Stockton community. Coordinating effectively and smoothly among these components and with the institutional/local/regional environment, Stockton University is moving forward fast and steadily in developing internationalization. Thus, internationalization of Stockton University has reached an Attractor State – a relatively stable development stage of internationalization.

A 'Snapshot' of Internationalization of Stockton University

Internationalization of higher education is a dynamic system, which means that it is changing over time. Therefore, what we are actually examining and measuring is just a static 'snapshot' of this non-stop evolving process of internationalization. It can be simple, complicated, or even chaos (Thelen & Smith 2006). It is temporary and flexible, and

demonstrates 'the strength of the attractions between components' (de Bot et al. 2007, p.8) at certain time and in certain context. Figure 2 shows a 'snapshot' of internationalization of Stockton University in May 2015.

Purposes of internationalization of Stockton University. Stockton has recognized *Global Perspectives* as one of the four essential parts of its strategic map. It is stated as 'We envision laying the foundation of our global theme by building a community capable of developing opportunities to collaborate across a diverse world of cultures, race, gender, orientation and age which prepares us for global participation. We understand that building a global perspective, is not limited to travel abroad. We do believe that in this effort, we should strive to capture the wealth of diversity and opportunity which exists locally, and nationally. Accomplishing this theme is a continuum that we will pursue over time.' (Stockton 2020 Strategic Map n.d.). This visionary statement emphasizes the efforts of continually developing global perspective in not only students' but faculty and staff members' experience as well, and the active involvement of students, faculty, staff, and local communities in Stockton's internationalization process. This statement highlights the need to move beyond education abroad and to use resources on campus and in the communities. More importantly, this statement points out that internationalization is an on-going and continuing process.

Outcomes of internationalization of Stockton University. Stockton has identified the *Global Awareness ELO* as the Outcomes or the knowledge, skills, and the attitude of its global learning. It is defined as 'the appreciation of the world as an interconnected, interdependent system encompassing political, socioeconomic, and environmental interactions' (Stockton Global Awareness ELO n.d.). A detailed three-level rubric – Aware, Competent, and Skilled – was created to explain that 'globally aware citizens pursue knowledge about people and places beyond their own realm of existence, and value multicultural communication, engagement, and collaboration. Such citizens exhibit an understanding of challenges affecting the globe and shaping its future. They possess the skills and competencies to challenge assumptions and analyse issues from multiple perspectives' (Stockton Global Awareness ELO n.d.).

Programs of internationalization of Stockton University. Working with the ACE Internationalization Lab, Stockton has explicitly identified five Programs that involve and urgently need internationalization – Internationalization of Courses and Faculty and Student Perspectives of Internationalization, Study Abroad Program and Study Tours, Languages and Cultures Studies, International Linkages and Faculty and Staff International Development, and International Student (Stockton ACE Review 2010). The activities happened in these five programs serve as catalysts for the development of internationalization at Stockton University.

Approaches and Projects of internationalization of Stockton University. Stockton has adopted four approaches to develop and implement internationalization. The first approach is adapting its curriculum for all students to develop a deeper and more critical perspective of global world, developments, and opportunities. All the activities in internationalization of higher education will eventually lead to internationalizing the curriculum; therefore, the success of internationalization is always reflected and achieved in successful curriculum internationalization (Huang 2006; Leask 2009, 2012, 2013a, 2013b, 2014; Olson et al. 2006). By internationalizing the curriculum, Stockton ensures that all students across disciplines are included and their unique knowledge and experience are acknowledged within all academic aspects of the university (Leask 2012; Spitzer & Zhou 2014). Related Projects include both curricular and ex-curricular activities such as Cultures and Languages across the Curriculum (CLAC) projects, Stockton Student Language Liaison Committee, International Education Week, Globalization Lecture Series, Model United Nations Stockton team, proposals of new courses, revisions of existing courses, and so on.
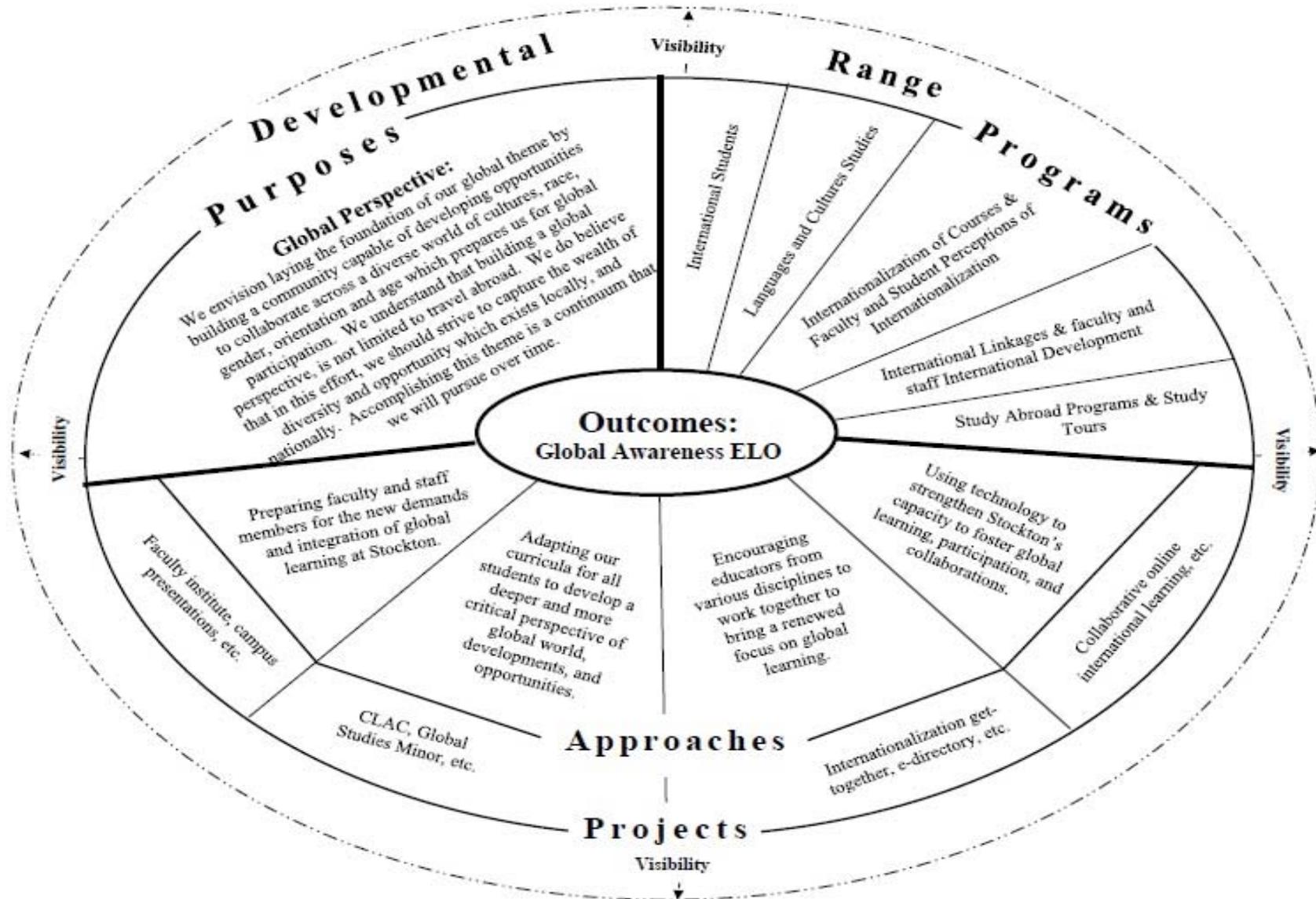
Figure 2. A "snapshot" of internationalization of Stockton University in May 2015.

The second approach is preparing faculty and staff members for the new demands and integration of global learning at Stockton. Faculty and staff members need to understand and recognize students' cultural backgrounds and experiences, and hence to provide strategies to incorporate them into various curricular, co-curricular, and extracurricular activities (Dewey & Duff 2009; Schuerholz-Lehr et al. 2007). Through this approach, internationalization of Stockton University becomes a dynamic process focusing on creating a community of global learning, in which faculty and staff members are deeply engaged. Related Projects include summer faculty workshop, brown bag talks at the Institute for Faculty Development, Globalization Teaching Circle, and so on.

The third approach is encouraging educators in various disciplines and from various institutions to work together to bring a renewed focus on global learning. Sights from different fields are converging to create a new science of learning that may transform educational practices (Meltzoff et al. 2009), thus collaborations across academic and geographical areas has become one of the most important skills to succeed in current globalized world. Stockton has initiated and developed several Projects of sharing faculty and staff members' teaching, research, and service interests to facilitate potential collaborations, including a survey of internationalization activities, a campus-wide get-together meeting and an e-directory of internationalization shareholders, interdisciplinary presentation panels, and dialogs with overseas institutions, and so on.

The fourth approach is using technology to strengthen Stockton's capacity to foster global learning, participation, and collaborations. Technology plays a key role in internationalization (Blue Ribbon Panel on Global Engagement 2011; Leask 2014; Roberts & Monroe-Baillargeon 2012). It expands communications at local, national, and international levels, and it can, and should, be used extensively in Stockton's internationalization. Video clips, websites, apps, webinars, social media, and digital tools are designed and implemented in various Projects, such as collaborative online international learning, online communications with overseas

institutions, online language learning community, digital badges, and so on.

The Control Parameter of internationalization of Stockton University. With close analysis of current situation of internationalization, Stockton has identified *Visibility* as its Control Parameter of internationalization. The value of Visibility of internationalization of Stockton University can be measured in three parts – What activities of internationalization are available at Stockton? How many activities of internationalization are available at Stockton? and How are these activities of internationalization available at Stockton? The answers to these three questions reflect the collective development of internationalization of Stockton University.

Being the Control Parameter of internationalization of Stockton University, Visibility is critical to its Developmental Range of internationalization since it measures internationalization of Stockton University as a whole (Fischer & Bidell 2006; Thelen & Smith 2006). Currently, Stockton has a low value of Visibility of internationalization (Spitzer & Zhou 2014; Stockton ACE Review 2010). Therefore, Stockton should focus on increasing the value of Visibility in the three parts, for example, recruiting more international students, encouraging more education abroad projects, proposing more and diverse courses and activities of internationalization, creating more buy-ins from students, faculty, staff, and administrators, providing multiple accesses to all the activities, promoting talks and collaborations between educators, and collecting and demonstrating outcomes and evidence of various projects of internationalization, and so on. By doing so, Stockton University will get more energy to strengthen and develop relationships between the components, expand its internationalization to the Developmental Range, and eventually be able to move forward to the next Attractor State effectively and efficiently.

The Wheel of Internationalization of Stockton University

The dynamic nature of internationalization of Stockton University shows that all Approaches are intertwined, that is, they support and

influence each other; moreover, each Approach works for one or more Programs, which makes those five Programs interconnected as well; furthermore, each Program contributes to the overarching Purposes and Outcomes of Internationalization of Stockton. All these interconnected relationships enhance the sustainability of internationalization of Stockton University.

The attractions between these Programs, Approaches, and Projects are dynamic – they are non-fixed, flexible, and changeable. The relationships are constructed individually depending on where a person situates himself/herself in the whole process/picture of internationalization of Stockton and how he/she draws connections among these components. Therefore, in practice, all these components of internationalization can also be viewed as four concentric circles, with Global Perspective and Global Awareness ELO as the central circle, five Programs as the second circle, four Approaches as the third circle, and various Projects as the fourth circle (see Figure 3). Everyone on campus can locate himself/herself in this picture, and then spin these four circles and make his/her unique combinations of Programs, Approaches, and Projects; thus he/she can develop a holistic as well as individual perspective towards internationalization of Stockton, which is critical to conceptualizing and promoting internationalization of Stockton University. Overall, internationalization of Stockton University is a dynamic system of embedding global perspective into all students' academic experience. Based on the history and current situation of internationalization, Stockton is able to define, develop, and coalesce its internationalization by continually interacting with various components and ecological factors, reorganizing itself internally, increasing the *Visibility* of internationalization, and developing holistic and individual perspectives of internationalization.

Conclusion

Internationalization has become a fundamental mechanism of higher education (Altbach et al. 2009; Knight 2004; de Wit & Hunter 2014; Olson et al. 2006; Yonezawa &

Shimmi 2015; Zha 2003). Therefore, there is a need for a reappraisal of the nature and development of internationalization of higher education from a dynamic systems perspective. More research on applying a dynamic systems approach to internationalization would be of great significance to higher education, including examining different levels of internationalization of higher education or comparing internationalization at the same level but in different contexts, such as nations, institutions, programs, or individuals. Identifying more Control Parameters would also be beneficial in understanding and developing internationalization. Is Visibility applicable to all contexts and levels of internationalization, which makes it a *universal* Control Parameter? Are there any other Control Parameters? And how to measure the values of these Control Parameters? The Developmental Range of internationalization of higher education is another topic needs further examination.

With more understanding of the dynamic nature of internationalization of higher education, researchers and practitioners can define, develop, and coalesce internationalization effectively and efficiently.

Author's Bio:

Dr. JIANGYUAN ZHOU is the Internationalization Specialist in Stockton University, Galloway, NJ 08205, USA. Email: jy.zhou@stockton.edu. Her work focuses on internationalization of higher education, internationalizing the curriculum, and global learning. She has several publications and conference presentations in this field.
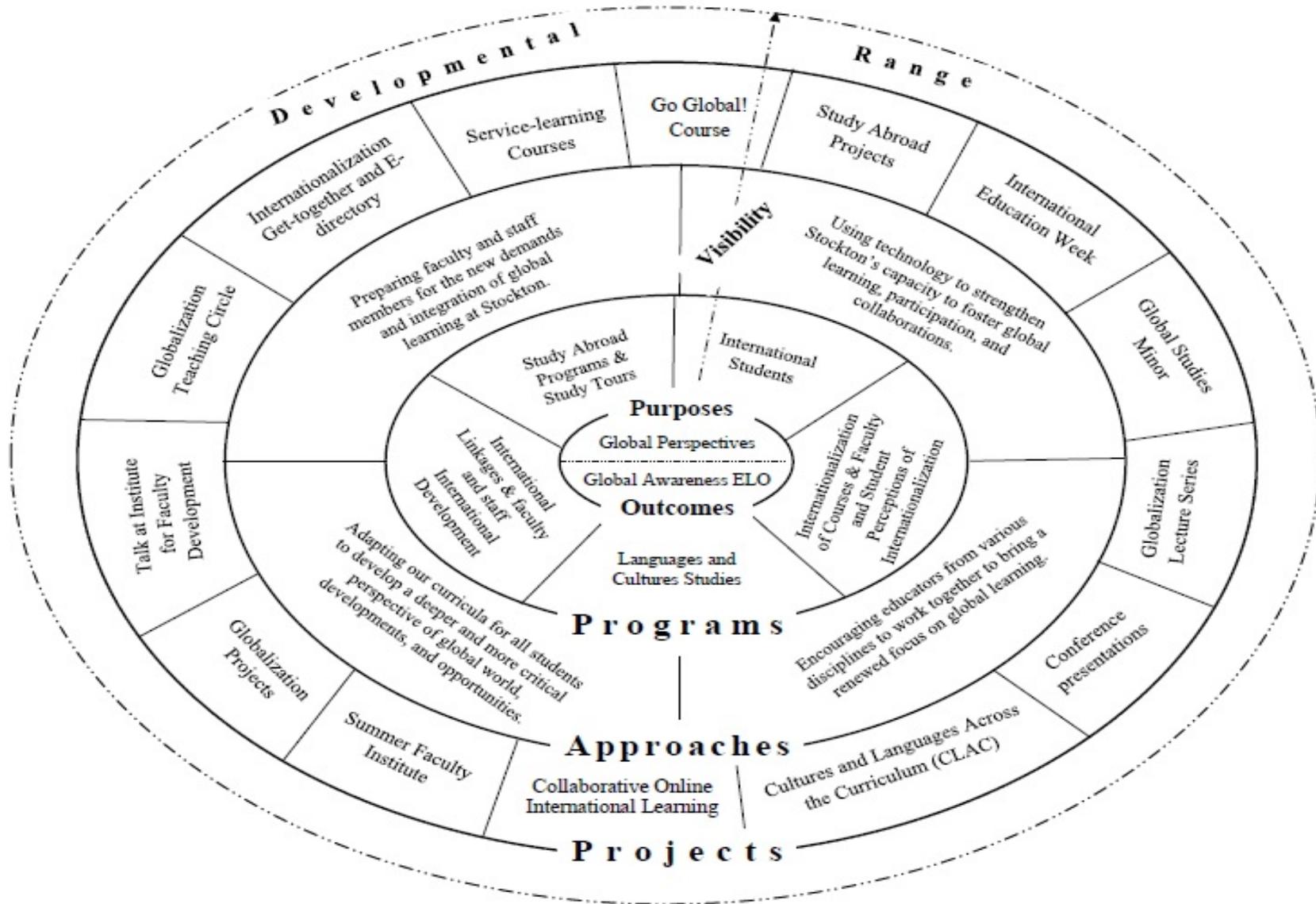
Figure 3. The wheel of internationalization of Stockton University.

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