

An Empirical Investigation of Sustainability Innovation Systems and the Stages of Sustainability Maturity

Full Paper

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Abstract

Sustainability innovation systems refer to the strategic investment in IT assets to enable business sustainability within each stage of sustainability maturity. The stages of sustainability maturity framework proposes that the role played by IT assets to support sustainability depends on the stage of sustainability maturity achieved. We set out to examine these propositions using data collected from the Global Reporting Initiative (GRI) reports of two high sustainability U.S. based firms in the pharmaceutical industry over a six-year period from 2009 to 2015. Our research provides some empirical support for the proposition that companies follow a staged path to sustainability maturity and their investments in IT assets reflect their maturity stage. Importantly, our research shows that GRI reports are a reliable secondary data source for scholars and practitioners who want to conduct longitudinal empirical studies on sustainability information systems.

Keywords

Sustainability Innovation Systems, green IT, green IS, IT assets.

Introduction

Sustainability is usually defined as meeting the needs of the present without compromising the needs of future generations (Brundtland 1987). There are serious challenges to achieving this vision of a sustainable society and planet. Leading thinkers have called for using the power of business to solve social problems such as climate change and social inequality by adopting a mission to create shared value (Porter and Kramer 2011). Instead of using the lens of corporate social responsibility, many scholars recommend integrating sustainability with business strategy to create value for both business and society. Research appears to support this approach by demonstrating higher financial returns and greater innovation for high sustainability firms (Eccles and Serafeim 2013; Nidumolu et al. 2009).

Given the increasing application of IT within business activities over the recent decades, information systems could play a key role in supporting businesses' sustainability strategy. Earlier research and practice on IT and sustainability has focused more on Green IT issues, which aim at reducing the carbon footprint of companies' IT technological infrastructure. However, more recent research and practice have placed more attention to information systems' capabilities to enable strategic business sustainability (Harmon and Demirkan 2011; Boudreau et al. 2008). Sustainability innovation systems refer to the strategic investment in IT assets to enable business sustainability within each stage of sustainability maturity (Abraham and Mohan 2015). This stages of sustainability maturity framework proposes that the role played by IT assets to support sustainability depends on the stage of sustainability maturity achieved. We set out to examine these propositions using data collected from the Global Reporting Initiative (GRI) reports of two high sustainability U.S. based firms in the pharmaceutical industry over a six-year period from 2009 to 2015. Thus, our research aims to provide initial answers to the research question: "How do companies invest in IT assets to support their sustainability strategy as they progress through the stages of the sustainability maturity framework?"

Literature Review

Nidumolu et al. (2009) demonstrate that a sustainability objective drives innovation. In other words, firms will find that adopting sustainability as a core value or mission actually promotes and drives innovation that will provide them with a competitive advantage. They identify five stages in the organizational path to sustainability, each producing innovations. In Stage 1, companies “view compliance as an opportunity” and comply with the most stringent regulations across all regions. In Stage 2, companies make “value chains sustainable” by working with suppliers and retailers to develop more sustainable practices and products, which involve more sustainable practices both with the firms and across their supply chains. In Stage 3, companies recognize consumer segments which prefer sustainable products and services and begin to design or redesign products aimed at such segments. In Stage 4, firms “develop new business models” for sustainability by rethinking both their products and business processes. In Stage 5, companies “create next-practice platforms” by questioning the assumptions underlying their current business practices. Table 1 summarizes the five stages of the sustainability maturity framework.

Businesses and managers making decisions on IT investments usually have a variety of operational and strategic purposes with regards to how/when/where such IT investments’ benefit should be realized in terms of helping to improve their businesses’ performance to justify such investments. A popular framework that has been used to differentiate IT assets is the IT strategic role framework that categorizes IT assets as performing automate, informate or transform roles (Schein 1992; Zuboff 1988).

- *Automate*: IT investments that help firms automate business processes, reducing or eliminating the hands-on role served by human assets in order to carry out work processes and work tasks faster, more efficiently and/or more accurately. Examples of automate investments include a grocery store’s self-checkout counters.
- *Informate*: IT investments that makes available new, timely, more complete and relevant data to managers, employees and external entities (e.g., customers and suppliers) such that these individuals better understand the work situations being faced to make better and faster decisions and carry out work processes and work tasks more effectively and/or more efficiently. An example of informate investment is a grocery retailer’s initiatives to capture information about product purchases at its retail stores, then analyzing such data and combining the results with other data to determine the specific products and their quantities to be stocked at each retail outlet.
- *Transform*: IT investments that help firms restructure or reconstitute business assets, capabilities, practices, processes and/or relationships that would fundamentally alter existing business processes and/or models that enable an organization to create new products/services that position firms more favorably in the product-markets. Examples of transform investments include FedEx’s overnight delivery model and Netflix’s DVD rental and movie streaming model.

Besides automate, informate, and transform roles, *infrastructure* investments (Dao et al. 2011; Aral and Weill 2007) include both technical and human assets such as servers, networks, user devices, shared databases, help desk, etc. that provide platforms through which standardized technical services are provisioned and based on which automate, informate, and transform assets are developed and deployed.

Stages	IT Investment Focus	Innovations
1. Beyond compliance	Infrastructure Optimization and Automate assets Ex. DCIM, self-check-out registers	Business continuity; Lean systems and continuous improvement; New services like the European Recycling Platform
2. Sustainable value chains	Infrastructure Integration and supply chain facing Informate assets Ex. ESM, VPNs, Reverse logistics IS,	Telecommuting, Lean supply chains, blended learning, Patagonia’s transparent supply chain, Fresh Direct’s green leaf deliveries; New products/services like selling electricity,

	LMS	insourcing, refurbished products
3. Sustainable products/services	Market facing Informate assets Ex. Social media IS, Collaboration IS, Crowdsourcing, Big data	Sustainable choices like the Prius and Clorox Green Works, energy optimization services like IBM's Green Horizon. Social innovations like microcredit and fair trade and employee online education like Starbucks
4. New business models	Business model Transform assets Ex. MOOCs, Bio-mimicry databases	Progressive's Snapshot device; Free higher education; Flipped classrooms; Bio-mimicking products
5. Next practice platforms	Infrastructure flexibility and platform Transform assets Ex. Exchanges, SaaS, FMS, mobile platforms, cloud computing	Spaza shops; Smart Grid; Sharing economy; Crowd funding; Internet of Things

TABLE 1: A staged approach to IT investments and sustainable innovation (Abraham and Mohan 2015)

As companies engage in sustainability strategy during different stages of the sustainability maturity framework, they might place different levels of investment on different types of IT assets to enable their sustainability strategy. Abraham and Mohan (2015) prescribe a longitudinal framework for investing in IT assets based on the stages of sustainability maturity. To support each stage of sustainability, IT departments would then need to invest in the appropriate IT assets. They call these assets and roles Sustainability Innovation Systems (SIS) and prescribe specific IT investments for each stage of sustainability (also see table 1).

In Stage 1, the framework prescribes IT investments to be made in infrastructure optimization and automate assets such as green data centers and truck routing software. In Stage 2, the focus moves to current external processes and IT investments need to be made in integration of infrastructure assets such as building integrated platforms and informate assets such as supply chain transparency. In Stage 3, the focus moves to future products and for IT investments to be made in market-facing informate assets such as social media information systems, crowdsourcing platforms and data analytics. In Stage 4, the focus moves to internal capabilities for the future and for investments in business model transform assets to increase. Examples include using biomimicry databases to create entirely new products and processes or new devices like the Snapshot device from Progressive insurance which creates a new model for auto insurance premiums. Finally, in stage 5, the focus is future-oriented and both internal and external and for IT investments to be made in infrastructure flexibility and platform transform assets. Examples include the Internet of Things and sharing economy platforms.

Methodology

We adopted the case study research method (Yin 2009; Ghauri 2004) to conduct a qualitative study of the relationship between sustainability and IT assets roles. A case study is "an empirical enquiry that investigates a contemporary phenomenon in depth and within its real-life context." (Yin 2009, p. 18) It is a particularly useful method when the study is attempting to understand how or why the phenomenon occurs. The purpose of our study is to explore how sustainability strategy is linked to the roles that IT plays. It is guided by a theoretical framework but does not attempt to explain causal links. Rather than use a single case, we chose two cases with the intention to draw cross-case conclusions. While we are studying a contemporary phenomenon, we are also examining the history of sustainability in the firms by collecting longitudinal data. We selected two companies for our study - Johnson and Johnson (J&J) and Biogen from the Pharmaceutical/Biotechnology industry. By pairing companies within an industry, we hoped to be able to draw cross-case conclusions. These companies were selected from the Corporate

Knights 2016 Global 100 Most Sustainable Corporations list. We also chose these particular companies since they were headquartered in the U.S., which we thought might make them more comparable and also give us access to annual 10-K reports if needed.

Data for these firms was collected from their published Global Reporting Initiative (GRI) reports over a six-year period from 2009 to 2015. GRI is “an international independent organization that helps businesses, governments and other organizations understand and communicate the impact of business on critical sustainability issues such as climate change, human rights, corruption and many others”. GRI has developed guidelines and standards for sustainability reporting and has maintained a publicly available database of sustainability reports submitted to GRI by companies. A significant number of Fortune 1000 companies have been engaged in submitting their sustainability reports to GRI. The information provided is fine grained and very detailed even though the focus is not on information systems per se. This makes the GRI reports a very useful source of secondary data collection for IS researchers especially those conducting longitudinal studies.

For J&J and Biogen, we examined their GRI reports using the keywords “IT”, “ICT”, “Information”, “Information Systems”, “Information technology”, “Internet”, “system”, “Information”. Paragraphs including these search terms that discuss IT investments addressing sustainability were collected. Longitudinal data was important since we were looking at the evolution of their sustainability maturity stages.

The qualitative analysis of the data was done in stages. The first stage, story-telling, was done by developing chronologies of the organization. The second stage involved sifting the data into conceptual categories by coding them. Coding rules were developed (see Appendix) to code IT investments in two categories – IT investment type and sustainability maturity stage. The IT roles/assets category has four asset roles – and Infrastructure (Infra), Automate (A), Informate (I), and Transform (T). The sustainability maturity category has five stages – Beyond Compliance Stage (S1), Sustainable Value Chains (S2), Sustainable Products (S3), New Business Models (S4) and Next Practice Platforms (S5). Two coders then independently coded the information systems in each of the categories – IT role and sustainability maturity stage. They then jointly reviewed the codes and reconciled any differences.

An Excel spreadsheet was created with the data for the two companies over the six years. Pivot tables were used to match up years to roles and stages. Then we pivoted roles against stages. These pivot tables allowed us to spot patterns in the data and also to examine the theoretical propositions from the framework with actual empirical data. Finally, some conclusions were drawn on the basis of the first two stages within and across cases.

Findings

The findings on each case – Biogen and J&J are presented individually and then compared in the following sections.

Biogen Case Study

Biogen is a leading biotechnology company with 2015 revenues of over \$10 billion. It makes the leading drug used to treat multiple sclerosis (MS) and several other therapies for neurologic diseases such as Alzheimer’s and Parkinson’s disease. In 2016 it was ranked 30 in the Corporate Knights Global 100 Most Sustainable Corporations list (In 2017 it has dropped off the list). The 2015 Corporate Citizenship report also lists a number of other awards for corporate responsibility. Data collected from GRI reports from 2009, 2012-2015 show that the company is committed to a triple bottom line approach. It is creating shared value (Porter and Kramer 2011) by applying business principles to social needs. Apart from producing solutions to underserved health needs, Biogen has worked to drive efficiency and reduce waste in the value chain and has developed local clusters with universities, NGOs and governments. For instance, working with MIT Sloan, Valutus and others, Biogen is developing a new online platform called SHIFT (Sustainability, Help, Information, Frameworks and Tools).

Biogen has been a carbon neutral company since 2014 by measuring their carbon footprint, reducing it through innovation and supplier engagement and neutralizing the rest by funding renewable projects. It has also shown leadership in areas such as diversity and community involvement. Biogen has shown

steady growth over the past 5 years in both revenue (\$5B in 2011 to \$10.8B in 2015) and income (\$1.4B in 2011 to \$3.9B in 2015). Earnings per share have tripled in the past 5 years (\$5.90 to \$17.01). Clearly Biogen is successfully addressing the triple bottom line.

Year	Total	Infra	A	I	T
2009	3	1	0	2	0
2012	1	1	0	0	0
2013	2	1	0	0	1
2014	7	1	0	3	3
2015	6	0	0	5	1
Total	19	4	0	10	5

TABLE 2: A longitudinal view of IT investments and roles (Biogen)

Biogen has developed several sustainability information systems that are discussed in the GRI reports. In 2009, the only systems mentioned were a Health and Safety Management system and an Environmental Management System. They also discuss their green data center. In 2012 the only mention of IT is the cooling equipment installed for one data center. We classified these systems as informate (I) or infrastructure (Infra) roles. They were all firmly in the first or second stage of sustainability. Then, starting in 2013, information systems moved front and center in the organizational strategy and structure. In what they term their “new R&D IT strategy”, data analysis becomes the driver of new product discovery and a reorganization of the company puts the head of IT alongside the head of R&D. By 2014, new health and digital tech groups were formed and data mining was introduced. Personalized medicine is introduced, facilitated by wearables and other IT solutions. We classify these systems as informate (I) and transform (T) roles and place them at the third and fourth stages of sustainability. Clearly, Biogen is maturing in its sustainability path and is using information systems as a key component of this growth.

The informate role dominates in the last two years (Table 2) while the infrastructure role diminishes. Even more striking is the emergence of the transform role since 2013 as the company strategy and structure moved to an IT centered approach.

Year	Total	S1	S2	S3	S4	S5
2009	3	1	2	0	0	0
2012	1	0	1	0	0	0
2013	2	0	1	0	1	0
2014	7	0	2	0	5	0
2015	6	0	1	3	2	0
Total	19	1	7	3	8	0

TABLE 3: A longitudinal view of stage of sustainability maturity (Biogen)

Biogen is unique among our cases in their movement over time from a stage 2 company focused on the value chain to a stage 4 organization with an emphasis on new business models (Table 3). They address underserved communities with new services and new delivery options driven often by information technology advancements such as data mining, cloud-based data collection and dissemination and tablet and smart device applications.

IT Role	S1	S2	S3	S4	Total

Infra		4			4
I	1	3	3	3	10
T				5	5
Total	1	7	3	8	19

TABLE 4: IT Role by stage of sustainability maturity (Biogen)

According to the framework, stage 1 should correspond to infrastructure optimization and automate roles. Our case data points to the informate role instead (Table 4). The framework prescribes infrastructure integration and supply chain facing informate assets in stage 2. Our case data supports these roles with three informate and 4 infrastructure systems at this stage. Market facing informate roles are prescribed for stage 3 and we do see three informate systems in stage 3. Business model transform assets are prescribed at stage 4 and we do see five transform systems along with 3 informate systems at stage 4. This Biogen case seems to support the sustainability innovation systems framework quite strongly.

J&J Case Study

J&J is a leading pharmaceutical company with 2015 revenues of over \$70 billion. It operates in three segments – pharmaceutical, medical devices and consumer - and has 127,000 employees worldwide. In 2017 it was ranked 8 in the Corporate Knights Global 100 Most Sustainable Corporations list. Data collected from GRI reports from 2009, 2011, 2013-2015 show that the company is committed to a triple bottom line approach. It is creating shared value (Porter and Kramer, 2011) by applying business principles to social needs. Using materiality maps, J&J has focused on the most material issues including Global Health and Transparency. J&J showed steady growth from 2011 through 2014 but revenues and net income dropped in 2015.

Year	Infra	A	I	Total
2009		1	4	5
2011	1		7	8
2013		3	3	6
2014		1	5	6
2015			5	5
Total	1	5	24	30

TABLE 5: A longitudinal view of IT investments and roles (J&J)

J&J has largely used IT in the informate role for sustainability initiatives (Table 5). These include websites to engage stakeholders and the use of mobile phones to keep mothers and pregnant women informed. There are initiatives to collect enterprise-level data on environmental and labor practices. In 2014, all major brands of J&J shared product sustainability information on their website. So, the focus of sustainability IS at J&J has been to collect social and environmental data across the enterprise and its supply chain and to make it widely available to all its stakeholders. This addresses the transparency issue identified in the materiality maps. The automate systems too have been in service to this informate role. In 2013, several automated data collection systems were launched to gather the data on training and grievance data on a global scale. Surprisingly there is no discussion in these reports on a transform role for IT such as the one that Biogen adopted. One would expect to see that happen going forward.

Year	S1	S2	S3	S4	Total
2009		2	3		5

2011	1	2	4	1	8
2013	1	4	1		6
2014		5		1	6
2015		4		1	5
Total	2	17	8	3	30

TABLE 6: A longitudinal view of stage of sustainability maturity (J&J)

More than half of J&J’s sustainability IS have been used to make value chains sustainable (Stage 2). They are used to collect and share data on environmental and social impacts such as training and grievances across the value chain. From 2009 through 2013 (Table 6), there were several IS (8) used to support sustainable products and services (Stage 3) such as websites and blogs and texting services providing information on sustainability to external stakeholders. More recently in 2014 and 2015, mobile devices are providing a new business model for delivering services to dispersed stakeholders such as mothers in Indian villages or grassroots entrepreneurs.

IT Role	S1	S2	S3	S4	Total
Infra		1			1
A		5			5
I	2	11	8	3	24
Total	2	17	8	3	30

TABLE 7: IT Role by stage of sustainability maturity (J&J)

According to the framework, stage 1 should correspond to infrastructure optimization and automate roles. Our case data points to the informate role instead. The framework prescribes investing in infrastructure integration and supply chain facing informate assets in stage 2. Our case data supports these roles with eleven informate and one infrastructure systems at this stage (Table 7). However, there are also five automate systems at stage 2. Market facing informate roles are prescribed for stage 3 and we do see eight informate systems in stage 3. Business model transform assets are prescribed at stage 4 but we do not see any transform systems. Instead we see 3 informate systems at stage 4. This J&J case seems to provide weak support for the sustainability innovation systems framework. Automate and infrastructure roles are exclusively played in making the value chain sustainable (S2). Informate roles are played in all stages except creating next practice platforms (S5). Mobile devices are creating opportunities for new business models (S4) and we would expect that transform assets will begin to appear to support this stage.

Cross Case Analysis

Both J&J and Biogen have invested in multiple IT-enabled sustainability initiatives over the years of the study. J&J invested in 30 initiatives, while Biogen invested in 19 initiatives. It is notable that most of the initiatives that J&J and Biogen invested in performed informate roles, 24/30 and 10/19 respectively. This highlights the importance of informate IT assets in enabling sustainability. Besides their big commitment to informate IT roles, J&J and Biogen have different priorities with regards to infrastructure, automate, and transform roles. While J&J invested in one infrastructure asset, Biogen invested in four.

Interestingly, while J&J invested in 5 automate initiatives and 0 transform roles, Biogen invested in 0 automate roles and 5 transform roles. This might reflect the differences between J&J and Biogen in viewing the strategic role of IT in enabling the companies’ sustainability strategy, with J&J viewing IT to play a more supporting role and Biogen viewing IT to play a more strategic role in enabling sustainability.

Both companies have initiatives in four stages of sustainability. J&J proportionally focuses more on S1 and S2 (19/30, 63%, initiatives), improving sustainability performance of its current business operations. Biogen proportionally focuses more on S3 and S4 (11/19, 58% initiatives), emphasizing more on initiatives

that enable new products and business models for sustainability. This could explain why J&J invested in automate but no transform assets, and vice-versa for Biogen.

Stage 1: Beyond Compliance

Stage one received the least attention by J&J and Biogen. J&J invested in 2 informate roles aimed at stage one, while Biogen invested in 1 informate role for this stage. Interestingly both companies did not implement infrastructure or automate roles for stage 1 as theorized. J&J initiatives focus on assessing risks in healthcare compliance and developing a database which enables locating sustainable sites meeting sustainability requirements. Biogen's initiative focuses on an Environmental Management System.

Stage 2: Sustainable Value Chains

Stage two received the most initiatives by J&J (17/30), second most by Biogen (7/19), indicating the companies' emphasis on utilizing IT to improve sustainability performance of their business operation activities across their current value chain. For its stage two initiatives, J&J invested in 1 infrastructure, 5 automate, and 11 informate roles. Meanwhile, Biogen invested in 4 infrastructure and 3 informate roles. In support of the SIS framework, a significant number of informate roles were invested in for Stage 2 sustainability. With regards to infrastructure, J&J focused 1 initiative on standardizing and simplifying IT systems, while Biogen invested in 4 initiatives on improving cooling energy efficiency and right-sizing servers.

With regards to automate roles, J&J focuses on initiatives on automatic data storage and retrieval, while Biogen did not implement any automate roles. With regards to informate roles, J&J invested in 11 initiatives. They include online tools for employees' management and training, risk assessment, health compliance, internal labor management systems, internal grievance management system, etc., as well as tools to engage and interact with stakeholders. (e.g. corporate blogs, health info sharing, etc.). Meanwhile, Biogen invested in 3 initiatives updating Health and Safety Management Systems and addressing risk reduction.

Stage 3: Sustainable Products/Services

As expected informate roles were used for Stage 3 sustainability. J&J invested in 8 informate roles for stage 3, while Biogen invested in 3 roles. J&J invested in multiple tools to engage and interact with stakeholders (e.g. corporate blogs, health info sharing, etc.), tools such as text4baby and mobile apps to share information with patients and reach out to patients, or tools to help business sectors share brand product sustainability on their websites.

Biogen, meanwhile, invested in 3 informate roles, including mobile apps to help patients track their health, and an online platform (in collaboration with MIT and others) to consolidate tools used to analyze corporate sustainability.

Stage 4: New Business Model

J&J invested in 3 informate roles for stage 4, while Biogen invested in 3 informate and 5 transform roles for stage 4 sustainability. As expected, all transform roles were developed for stage 4. J&J's 3 informate roles include mobile phone tools share info and reach expectant moms in underserved developing markets (e.g. India), as well as a system to collect and report health-related outcomes added to an existing system which connects grassroots entrepreneurs. Biogen's 3 informate roles include tools to reach underserved communities, and its 5 transform roles include centering the IT function in R&D and using data analytics to create new products and services. Biogen is also using cloud-based data collection and dissemination and wearables and tablet-based tools to transform diagnosis and treatment of patients by allowing local health care workers to collect data from patients and compare those results instantly with normative data.

Conclusion

Our research has provided some empirical support for the proposition that companies follow a staged path to sustainability maturity and their investments in IT assets reflect their maturity stage. Our findings show that during earlier stages of maturity, companies invest in automate and infrastructure assets to help enable sustainability initiatives. In later stages firms invest in transform assets. However, we also found that at all stages firms invest in informate assets. These findings are based on just two cases in one industry. Clearly, more cases from other industries will need to be analyzed. Importantly, our research shows that GRI reports are a reliable secondary data source for scholars and practitioners who want to conduct longitudinal empirical studies on sustainability information systems. Our methodology also provides specific coding rules to support such future studies.

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APPENDIX: CODING RULES

Definition of IT-enabled Business Initiatives:

Automate: Replace human labor by automating business processes.

Informate: Provide data/information to empower management, employees or customers. OR initiatives that filter/target information for social impacts.

Transform: Fundamentally alter traditional ways of doing business by reconstituting business processes and relationships.

Infrastructure: Resources that comprise of standardized IT services deployments (both technical and human, such as servers, networks, and help desk) that provide platforms through which standardized technical services are provisioned and from which automate, informate, and transform IT resources are utilized to deliver their intended business objectives.

Definitions of 5 stages of sustainability (Nidumolu et al., 2009)

Stage 1: Viewing Compliance as Opportunity - To ensure that compliance with norms becomes an opportunity for innovation. It's smarter to comply with the most stringent rules, and to do so before they are enforced. This yields substantial first-mover advantages in terms of fostering innovation.

- *IT focus* - Infrastructure Optimization and Automate assets Ex. DCIM, self-check-out registers.

Stage 2: Making Value Chains Sustainable - To increase efficiencies throughout the value chain.

The drive to be more efficient extends from manufacturing facilities and offices to the value chain. At this stage, corporations work with suppliers and retailers to develop eco-friendly raw materials and components and reduce waste. (improving sustainability performance of current internal operation and external-stakeholder relationships (supply chain partners, customers, etc.)

- *IT focus* - Infrastructure Integration and supply chain facing Informate assets Ex. ESM, VPNs, Reverse logistics IS, LMS

Stage 3: Designing Sustainable Products and Services - To develop sustainable offerings or redesign existing ones to become eco-friendly (Develop new, previously unavailable, sustainable products and services, or significant redesign of existing products and services for sustainability)

- *IT Focus* - Market facing Informate assets Ex. Social media IS, Collaboration IS, Crowdsourcing, Big data.

Stage 4: Developing New Business Models - To find novel ways of delivering and capturing value, which will change the basis of competition.

- *IT Focus* - Business model Transform assets Ex. MOOCs, Bio-mimicry databases

Stage 5: Creating Next-Practice Platforms - To question through the sustainability lens the dominant logic behind business today.

- *IT Focus* - Infrastructure flexibility And platform Transform assets Ex. Exchanges, SaaS, FMS, mobile platforms, cloud computing, Smart Grid, IoT.

Coding Rules:

1. Code at the level of the paragraph, the appropriate code is the highest level (automate, informate, transform) usage of IT indicated in the paragraph.
2. Code for highest (for Infra,AIT, and Stage) when enough information available. Lowest when not enough information.
3. If there is not enough detail to determine the nature of the business IT-enablement involved (such a discussion could be based on altering a manual system), no code is assigned. If there is enough detail to determine that business IT-enablement is involved but not enough to distinguish automate, informate or transform, assign a code of automate.
4. Code multiple instances of the same issue but only if each instance includes enough detail about the IT issue to assign a code (in other words, do not assign a code based on information provided in other paragraphs).
5. Code for information about information technology that is embedded in industrial technology with enough detail.
6. Same initiative mentioned across multiple years: Only code for first year that it is mentioned
7. Providing a new channel for old information is automate (i.e., using technology to provide traditional services to the deaf, providing an on-line chat capability where media alternatives have been available, etc.)
8. Teleconference system: infrastructure
9. IT providing new information to customers: informate.
10. IT creating new information flows: informate.
11. IT changing the way a marketplace operates: transform
12. IT providing a new capability or a new service that restructures the product-market: transform.
13. New IT-based products typically transform.
14. IT-related alliances:
 1. Strategic alliances or strategic acquisitions are typically transform;
 2. Marketing alliances are typically automate (e.g., joining Yahoo!);
 3. Global alliances (i.e., partnering to gain access to a new geographic market) should not be coded unless the alliance was driven by a specific IT-related objective;
 4. Outsourcing is generally not a strategic alliance; thus, it would typically be coded as automate.
15. Adding a new product, even through an IT channel, is not be coded. For instance, selling a new mutual fund electronically would not be coded if the electronic sales channel already existed; however, initially building the electronic sales channel is coded as automate.